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Public Perspectives of Nuclear Weapons in the Post-Cold War Environment

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PUBLIC PERSPECTIVES OF NUCLEAR WEAPONS IN THE POST-COLD WAR ENVIRONMENT*

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Abstract (U)

This report summarizes the findings of a nationwide survey of public perceptions of nuclear weapons the post-cold war environment. Participants included 1,301 members of the general public, 1,155 randomly selected members of the Union of Concerned Scientists, and 1,226 employees randomly selected from the technical staffs of four DOE national laboratories. A majority of respondents from all three samples perceived the post-cold war security environment to pose increased likelihood of nuclear war, nuclear proliferation, and nuclear terrorism. Public perceptions of nuclear weapons threats, risks, utilities, and benefits were found to systematically affect nuclear weapons policy preferences in predictable ways. Highly significant relationships were also found between public trust and nuclear weapons policy preferences. As public trust and official government information about nuclear weapons increased, perceptions of nuclear weapons management risks decreased and perceptions of nuclear weapons utilities and benefits increased. A majority of respondents favored decreasing funding for: (1) developing and testing new nuclear weapons; (2) maintaining existing nuclear weapons, and (3) maintaining the ability to develop and improve nuclear weapons. Substantial support was found among all three groups for increasing funding for: (1) enhancing nuclear weapons safety; (2) training nuclear weapons personnel; (3) preventing nuclear proliferation; and (4) preventing nuclear terrorism. Most respondents considered nuclear weapons to be a persistent feature of the post-cold war security environment.

*The work described in this report was performed for Sandia National Laboratories under Contract No. AF-4189.

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PUBLIC PERSPECTIVES OF NUCLEAR WEAPONS IN THE POST-COLD WAR ENVIRONMENT

Findings and Analysis of the

NATIONAL SECURITY SURVEY:
PERCEPTIONS AND POLICY CONCERNS
1993 - 1994

The Institute for
Public Policy

University of New Mexico

Georgia Institute of Technology

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CONTENTS

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EXECUTIVE SUMMARY

Chapter 1: Introduction and Research Design

This report summarizes selected findings of a national security survey conducted between June 1993 and March 1994. The survey sought to determine how separate sectors of the U.S. public perceive nuclear weapons in the post-Cold War environment and to identify parameters which may influence future policy debates about nuclear weapons. A nationwide telephone survey of 1,301 randomly selected households provided general public views. To provide a scientific perspective likely to be more critical of nuclear weapons technologies and policies, a printed survey was administered to 1,155 randomly selected members of the Union of Concerned Scientists (UCS). To provide a balancing perspective likely to be more supportive of nuclear weapons technologies and policies, the same printed survey was administered to 1,226 randomly selected members of the technical staffs of four national laboratories: Pacific Northwest Laboratory; Lawrence Berkeley Laboratory; Sandia National Laboratories; and Los Alamos National Laboratory. Comparing the views of the two science groups provides insight as to the spectrum of technical opinion about selected nuclear weapons issues, and comparisons with the general public provide contrast with non-technical perspectives.

Chapter 2: The Post-Cold War Security Environment

The end of the cold War and the demise of the Soviet Union were not perceived by any of the three respondent groups to have created a safe, substantially less threatening international environment. Only 43 percent of all participants thought the breakup of the Soviet

Union decreased the chances that the U.S. will become involved in a nuclear conflict, and 61 percent of respondents thought the chances of nuclear war occurring somewhere in the international system had increased since the breakup of the Soviet Union.

Three out of four respondents thought the likelihood of nuclear proliferation had grown, and similarly strong majorities judged the risks to the U.S. of further proliferation to be very high. The current and future threat of nuclear terrorism were also rated high by all three groups, and statistically significant relationships existed between perceptions of nuclear proliferation and the threat of nuclear terrorism.

Nuclear weapons were perceived to be a persistent aspect of the international system, with only one in three respondents considering it feasible to eliminate all nuclear weapons in the next 25 years. If such weapons were to somehow be eliminated, respondents were pessimistic about their permanent demise, with 85 percent of respondents agreeing it would be extremely difficult to keep others from rebuilding them. The post-Cold War security environment was seen to be one in which profound changes have occurred without significantly lessening the potential for nuclear conflict. The result is a still dangerous and less predictable environment in which nuclear arsenals are a persistent fact of life and a source of continuing concern.

Chapter 3: Perceptions of the Risks of Managing Nuclear Weapons

The risks associated with manufacturing, testing, transporting, storing, and disassembling nuclear weapons, as well as storing nuclear materials from disassembled weapons, were perceived by the UCS and general public respondents to be substantial. Respondents from the national laboratories considered the risks of each activity to be about one-half as great as the other two groups. As self-rated knowledge of national security issues and nuclear technology increased, respondent perceptions of nuclear weapons management risks decreased.

The likelihood of unauthorized or accidental use of U.S. nuclear weapons was rated below mid-scale by all three groups, but UCS and public groups judged such events to be twice as likely as did participants from the national labs.

Long-term storage of radioactive wastes was viewed with concern by all three groups. Only 18 percent of all respondents considered current practices adequate for safe long-term storage. Opinion was divided about the likelihood that safe long-term storage can ever be accomplished, with two out of three public and UCS respondents agreeing that it will never be safe, and three out of four respondents from the national labs voicing a more optimistic outlook.

When asked to assess the relative importance of five international issues (global warming, illegal drug trafficking, the AIDS epidemic, the spread of nuclear weapons, and world hunger), all three groups ranked nuclear proliferation second in priority only to world hunger among the selected issues.

Chapter 4: Perceptions of the Utility of Nuclear Weapons

A majority of all three groups considered maintaining military superpower status to be important to U.S. national interests. A majority of public and national lab respondents considered nuclear weapons to be important to U.S. prestige and international leadership. Less than half the UCS respondents agreed. Fully 82 percent of lab respondents and over half of respondents from the general public considered nuclear weapons to have played an important role in preserving the American way of life during the past four decades. Only 40 percent of UCS participants concurred.

As to the domestic benefits of nuclear weapons, none of the groups perceived a relationship between nuclear weapons and lower overall defense costs. Fewer than one in four respondents agreed that a nuclear arsenal allows the U.S. to spend less for national defense than would be necessary without nuclear weapons. Respondents from the general public and the national labs perceived defense industry jobs to be of much greater economic value than did UCS participants. Lab respondents also rated the value of technology transfers from the defense establishment to other areas of the U.S. economy considerably higher than did their scientific counterparts in the UCS.

Chapter 5: Trust

UCS respondents were highly skeptical of official information about the environmental effects of nuclear weapons production, with 81 percent considering government information to be unreliable. Respondents from the general public were also critical, with less than one-fourth considering government information to be accurate. Lab respondents were somewhat more confident in official information about the environment and nuclear weapons production, but their mean evaluation was still below mid-scale.

When asked to express their trust in several government and nongovernment institutions from which the public receives information about nuclear weapons, public and lab respondents evidenced only moderate trust in either the Department of Defense (DoD) or the Department of Energy (DoE). Respondents from the UCS were highly distrustful of both. Public trust in watchdog groups critical of nuclear weapons was mid-scale, with UCS respondents placing relatively more, and lab participants placing substantially less trust in

such groups than did the public sample. Public and UCS respondents considered media information to be moderately trustworthy, while lab personnel were highly distrustful. Information provided by Congress was unanimously rated as largely unreliable by all three groups. Overall, the general public sample considered nuclear weapons information provided by university scientists and watchdog groups to be most trustworthy, and judged Congress, the DoD and the media to be least reliable. UCS participants also ranked university scientists and watchdog groups highest, but placed DoE and DoD at the bottom. Lab respondents judged scientists at the national laboratories and at universities and colleges to have the most credibility, and they most distrusted watchdog groups and the mass media.

A statistically significant relationship was found among all three groups between perceptions of trust and perceptions of risks and utilities associated with nuclear weapons. As trust in official government information about nuclear weapons increased, perceptions of nuclear weapons risks decreased and perceptions of nuclear weapons utilities increased. Conversely, as trust in information about nuclear weapons provided by nonestablishment sources increased, perceptions of risks increased and perceptions of utilities decreased.

Chapter 6: Policy and Spending Implications

Two out of three respondents thought national laboratories should pursue technologies which might make existing nuclear weapons more safe, but 91 percent of UCS participants, over half of public respondents, and nearly half of lab personnel did not think national laboratories should pursue technologies leading to new types of nuclear weapons.

About half of the respondents from the general public and the labs considered underground nuclear testing to be extremely important for the safety of nuclear weapons. In contrast, three out of four UCS respondents rated the value of nuclear testing below midscale.

Strong majorities of all three groups felt that spending for developing and testing new nuclear weapons should decrease. Most lab and public participants thought funding for maintenance of existing nuclear weapons should remain the same or increase, while three out of four UCS respondents preferred to decrease funds for maintaining the nuclear arsenal. A majority of public and UCS participants thought spending to maintain the ability to develop and improve nuclear weapons in the future should decrease, while most lab personnel preferred to retain or increase funding levels. Consensus existed among lab and general public respondents to increase funding for research to enhance the safety of existing nuclear weapons, but UCS support was mixed. There was strong agreement among all three groups that funding should increase in three areas: (a) training to insure the competence of those

who manage nuclear weapons; (b) preventing the spread of nuclear weapons; and (c) preventing nuclear terrorism.

While there was substantial support among all groups for further negotiated reductions below currently agreed levels of nuclear weapons, there was also strong support among the lab and public respondents for retaining a nuclear arsenal. UCS respondents were more equivocal about retaining U.S. nuclear weapons, feeling their actual use could not be morally justified. A majority of public and lab respondents felt that if the U.S. was attacked by another country using nuclear weapons it would be morally justifiable for the U.S. to retaliate with nuclear forces.

LIST OF ILLUSTRATIONS

TABLES

CHAPTER ONE:

INTRODUCTION

The end of the Cold War provides a unique opportunity to assess and restructure U.S. national security arrangements, and as one of the most critical aspects of security planning, the future role of nuclear weapons is particularly important. Policy decisions must be made about: (1) future nuclear research and development; (2) the structure, deployment and basing of U.S. nuclear forces; (3) nuclear force capabilities, alert posture, and survivability; and most importantly, (4) about how U.S. nuclear doctrine and strategy should be influenced by the profound changes of the post-Cold War environment.

Many of these decisions will be substantially influenced by international dynamics, including developments in the successor states to the Soviet Union, the progress of emerging democracies and market economies, and other important systemic variables such as nuclear proliferation and the threat of nuclear terrorism. But decisions about restructuring U.S. national security will also be significantly influenced by domestic politics and competing resource requirements. U.S. national security policy has traditionally been less open to public debate than many areas of purely domestic policy because of international influences, the sensitive nature of security arrangements, the complexities of nuclear technology and military strategy, and other reasons. But increasingly, the interdependence of domestic and international economics, national and systemic security, and international and domestic politics are making the separation of foreign, domestic, and security policies less distinct.

There are also indications that the American public may be less willing to delegate foreign policy and national security arrangements to an elite national security establishment schooled in the intricacies of diplomacy and nuclear strategy. For example, there appears to be increased public sensitivity to the economic consequences of defense restructuring. There is growing public awareness of how nuclear weapons research and de-

velopment may have affected public safety. There is vigorous public debate about nuclear materials management. In the post-Cold War environment, U.S. public perceptions of nuclear weapons risk-benefit considerations are likely to be an increasingly important factor influencing national priorities and the restructuring of U.S. security arrangements.

SECTION 1.1: OBJECTIVES

The primary objectives of this study are to determine how members of various sectors of the U.S. public perceive nuclear weapons in the post-Cold War environment and to identify parameters which may influence future policy debates about nuclear weapons related issues. Of particular interest are: (1) the processes by which public perceptions of threats and risks associated with nuclear weapons are weighed against their perceived utilities and benefits within the context of U.S. national security requirements; (2) levels of public trust in government agencies charged with nuclear weapons development and management; and (3) nuclear weapons policy preferences and priorities among both the general public and scientifically trained sectors of the public;

It would also be useful to better understand which variables act in what ways to influence individual perceptions and preferences of national security issues and policy choices. How do individual characteristics and experiences such as age, gender, education, income, or other demographic factors influence security policy preferences? How do various social and political lenses, such as political culture, ideology, and other belief systems help shape policy evaluation? How do policy preferences in related areas, such as nuclear materials management, influence perceptions and preferences for managing nuclear weapons? How do perceptions of external or systemic threats interact with other variables to define acceptable levels of security? The scope and detail of data about public opinion of national security and nuclear weapons issues collected in this study are unprecedented, and though this research cannot provide comprehensive understanding of these and other in-

teracting variables influencing security issues and security policy preferences, incremental gains may emerge from careful analysis of study results.

SECTION 1.2: CONCEPTUAL APPROACH

U.S. public attitudes about nuclear weapons are at least partially a function of risk-benefit assessments. Perceptions of external threats associated with nuclear weapons may include such variables as the perceived likelihood of nuclear war, the proliferation of nuclear weapons, and the potential for nuclear terrorism. Perceptions of nuclear risks may include the potential for accidental or unauthorized use of nuclear weapons by the U.S. or other nuclear powers, environmental hazards, lost opportunities for alternative uses of resources required to develop and maintain a nuclear arsenal, lack of public participation in nuclear policy development and evaluation, and troubling moral implications associated with weapons of mass destruction.

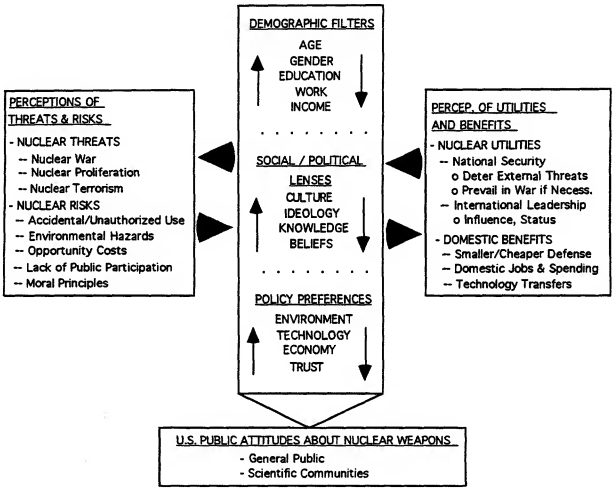
Utilities and benefits associated with nuclear weapons may include their role in deterring external threats, the power and influence nuclear weapons may contribute to U.S. status and prestige within the international system, jobs and other economic benefits derived from domestic spending associated with nuclear capabilities, technological advancements and transfers from the nuclear establishment to other public sectors, and the larger implications for preserving freedom, independence, and the "American way of life."

While the exact mechanisms and processes by which these trade-offs are resolved among the public is not known precisely, one way they may be conceptualized is represented in Figure 1.1 below. This model suggests that public evaluation of nuclear weapons is an ongoing, iterative process in which the perceptions of threats and risks of nuclear weapons and perceptions of their utilities and benefits are evaluated within the context of a number of variables specific to each individual. Among them are: (1) demographic factors such as age, gender, education, income, training, and work experience; (2) social and political lenses shaped by political culture (world view), political ideology, subject knowledge, and

more general belief systems; and (3) public policy preferences about related issues such as the environment, the role of technology in society, economic considerations, and trust in public institutions and processes.

Figure 1.1

Analytic Model



SECTION 1.3: RESEARCH DESIGN

Three separate lines of investigation were pursued in this study. Based on preliminary hypotheses and focus group work, perceptions of the general public were sampled for comparison with the opinions and preferences of two technically trained groups chosen for

the purpose of illuminating contrasting scientific opinions. Randomly selected members of the Scientists' Action Network of the Union of Concerned Scientists (UCS) were chosen to represent the views of scientifically trained persons who (on the basis of group membership) were expected to understand nuclear weapons technology from a relatively critical or negative perspective. Randomly selected members of the technical staffs at four national laboratories were chosen (on the basis of place of employment) to represent the views of scientifically trained persons who were likely to understand nuclear weapons technology from a relatively supportive or positive perspective.

The comparison of these three perspectives provides an equal number of unique opportunities. First, differences between comparably trained and educated members of the U.S. scientific community who may bring contrasting world views, preferences, and priorities to the consideration of national security policy may help illuminate the boundaries of scientific debate regarding risk-benefit considerations of nuclear weapons. Second, some of the factors influencing the process by which scientific opinion is formed may be better defined, and the influence that sets of variables such as demographics, political culture, and general policy preferences exert on the interpretation of scientific data about nuclear issues may be better understood. Third, comparing the perceptions and preferences of each of the two scientific communities to that of the lay public may identify differences in how education and training can influence perceptions and policy preferences concerning nuclear weapons issues, and may provide gross indications of the general public's level of interest and understanding of nuclear policy options. A brief description of the methodology used for all three avenues of investigation is summarized below.

SECTION 1.4: METHODOLOGY

Focus Groups

Three focus groups were held in June 1993 representing each of the three segments of the public to be sampled. Participant descriptions and a summary of comments are pro-

vided in Appendix 2. Results were used to clarify concepts pursued in the study, and to help design the survey instrument.

Survey Instrument

A survey instrument consisting of 158 questions arranged in three sections was developed. A pretest was conducted using members of each of the three target groups, and refinements to the instrument were incorporated. All three sections of the survey were asked of each of the two science groups, and two of the three survey sections were asked of the general public. Section two was omitted from the general public survey, because it included questions regarding the philosophy of science, technical interpretations of scientific data, and other questions deemed inappropriate for respondents not formally trained in the sciences. The survey questions and the frequency distributions of responses and mean values for each of the three respondent groups are provided in Appendix 1.

General Public Survey

A nationwide telephone survey of 1,301 randomly selected U.S. households was conducted between July 20 and August 19, 1993. The sample frame was obtained from Survey Sampling, Inc., of Fairfield, Connecticut. The survey was conducted using the University of New Mexico's Computer Aided Telephone Interviewing System, and employed stringent quality control measures throughout the data collection process. An overall cooperation rate of 67 percent was achieved. Response rate calculations are specified at Appendix 3. Sample size and random selection procedures provide a $\pm$ 3 percent sampling error.

Union of Concerned Scientists (UCS)

The Union of Concerned Scientists sample was obtained using Dillman's total design method.[1] A printed survey was mailed to randomly selected members from the Scientists' Action Network of the Union of Concerned Scientists, employing a sequence of mailings including: (1) an initial contact letter stating the purpose and objectives of the survey; (2) a follow-up letter and a copy of the survey instrument; (3) a reminder card mailed to those who had not responded within ten days; (4) a second copy of the survey and a follow-up letter mailed to those who had not responded within 30 days of the mailing of the first survey; (5) a second reminder card mailed to those who had not responded with ten days of the mailing of the second copy of the survey; and (5) a thank you card mailed to those who responded with a completed survey. A total of 1,155 respondents replied during the period between August and December 1993, yielding an overall response rate of 55 percent. A detailed accounting of the response rate is provided in Appendix 3.

National Laboratories

The same written instrument and methodology was used to survey personnel randomly selected from the technical staffs of four national laboratories within the Department of Energy. Two of the institutions, Pacific Northwest Laboratory and Lawrence Berkeley Laboratory, do not normally conduct nuclear weapons research. The remaining two institutions, Sandia National Laboratories and Los Alamos National Laboratory, normally include nuclear weapons related technologies among their research agendas.[2] Written surveys of the four participating labs were administered between October 1993 and March 1994, yielding a total of 1,226 respondents and a combined response rate of 53 percent. An accounting of response rates from each participating laboratory is provided in Appendix 3.

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[1] Dillman, Donald A., 1978, *Mail and Telephone Surveys: The Total Design Method*, New York: Wiley.

[2] Lawrence Livermore National Laboratory, Oak Ridge National Laboratory, Argonne National Laboratory, Brookhaven National Laboratory, and the Idaho National Engineering Laboratory declined to participate in the survey.

CHAPTER TWO

THE POST-COLD WAR SECURITY ENVIRONMENT

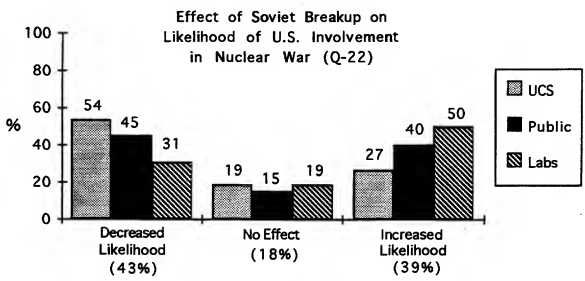
SECTION 2.1: PUBLIC PERCEPTIONS OF THE POST-COLD WAR SYSTEM

It became apparent during the three focus groups, each representing one of the research populations, that the end of the Cold War and the demise of the Soviet Union were not perceived to have created a safe, nonthreatening international environment. Most participants in each focus group felt that the ideological struggle, with its clearly defined boundaries of dispute and neatly categorized allies and adversaries, had been replaced with a much more amorphous, confusing, and unpatterned array of potential threats characterized by ethnic, cultural, and economic struggles. The transformation from a world in which opposing ideologies and forces were arrayed on either side of the symbolic Berlin Wall, to one in which former adversaries are now seeking Western economic and security assistance, and former allies are increasingly the U.S.'s economic rivals, has had a somewhat disorienting effect. Participants in the focus groups were worried about the potential for ethnic strife, nuclear proliferation, and nuclear terrorism. The uncertainty and unpredictability of the post-Cold War era was at least as worrisome to them as the more familiar former threats of the East-West standoff.

Survey results indicated that concerns evidenced in the focus groups were similarly perceived among their broader constituencies. Three survey questions specifically probed perceptions of how the dissolution of the Soviet Union influences international stability and security. Respondents were first asked how they thought the breakup of the Soviet Union affects the chances that the U.S. will become involved in a war in which nuclear weapons are used (Q-22). As shown in Figure 2.1, while slightly more than half of UCS respondents thought the risks of the U.S. becoming involved in a war in which nuclear weapons are used have decreased, less than half of the public and only about one-third of respondents from the participating U.S.

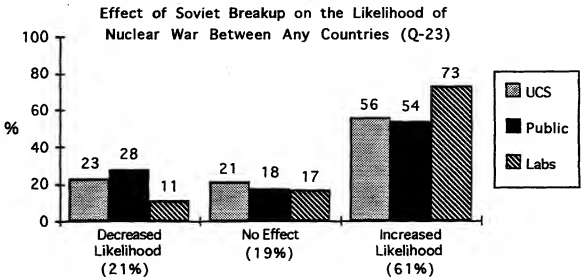
national laboratories (USNLs) shared that perspective. Among USNL respondents, about one-half thought that the chances of the U.S. becoming involved in a nuclear war have increased since the end of the Cold War, and about 40 percent of respondents from the general public and slightly less than one-third of UCS respondents shared that more pessimistic assessment. The views of the two scientific communities were virtually mirror images, with the public situated between them.

Figure 2.1



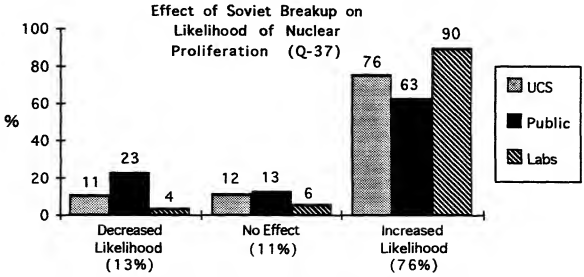
Respondents were also asked how the demise of the Soviet Union affects the possibility that nuclear weapons will be used by any country against any other country (Q-23). Here, there was considerably more agreement between the three samples, with more than half of each group perceiving the likelihood of nuclear war occurring somewhere in the international system to have increased since the end of the Cold War. These results are shown in Figure 2.2.

Figure 2.2



Finally, respondents were asked how the breakup of the U.S.S.R. affects the likelihood that nuclear weapons technology will spread to additional countries (Q-37). Figure 2.3 shows that in this case opinion was even more congruent, with large majorities of each sample perceiving increased likelihood of further nuclear proliferation. Fully 90 percent of USNL participants and 76 percent of UCS respondents shared this perspective about the likelihood of a more "proliferated" international system.

Figure 2.3



Thus it appears that none of the three groups of respondents is sanguine about the post-Cold War threat environment. While UCS respondents were less likely to perceive a nuclear threat to the U.S. than were public respondents and those from participating national laboratories, a significant majority of all three groups did not perceive the breakup of the Soviet Union to have decreased the chances for nuclear war in general, or the likelihood of further nuclear proliferation.

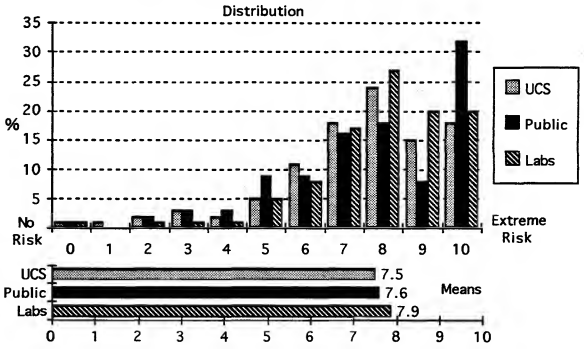
SECTION 2.2: CONSEQUENCES OF THE POST-COLD WAR ENVIRONMENT FOR U.S. SECURITY

Nuclear Proliferation

When asked to assess the consequences for the U.S. if more countries have nuclear weapons (Q-38), all three respondent groups rated the attendant risks at similarly substantial levels of concern. Figure 2.4 illustrates the distribution and comparative mean responses.

Figure 2.4

Risks to the U.S. of Nuclear Proliferation (Q-38)



To gain some measure of the degree to which respondents were informed about the current level of nuclear proliferation in the international system, a series of questions were asked as to whether specific states currently possess nuclear weapons. Ten states about which there is wide-spread consensus as to their nuclear weapons status were included. In Table 2.1 below, the nuclear weapons status indicated for each state reflects the latest consensus available in open source literature; "correct" responses of each respondent population for each state in question are expressed in grouped percentages.[3]

Table 2.1: Perceptions of Current Nuclear Proliferation (Q-26-35)

		% CORRECT		
STATE	CONSENSUS NUC. WEAPONS STATUS	PUBLIC	UCS	NAT'L. LABS
Canada	No	47	62	61
Germany	No	22	57	52
India	Yes	51	84	84
Kazakhstan	Yes	57	56	54
Japan	No	34	73	65
China	Yes	92	94	96
Mexico	No	82	86	90
Israel	Yes	92	93	92
Ukraine	Yes	77	87	90
Pakistan	Yes	68	76	70

[3] For Israel see: Aronson, Shlomo, with Oded Brosh, 1992, *The Politics and Strategy of Nuclear Weapons in the Middle East: Opacity, Theory and Reality, 1960-1991: An Israeli Perspective.* Albany: State University of New York. See also: Hersh, Seymour M. 1991, *The Samson Option: Israel's Nuclear Arsenal and American Foreign Policy,* New York: Random House. For India see: Albright, David and Mark Hibbs, 1992, "Pakistan's Bomb: Out of the Closet," *The Bulletin of Atomic Scientists,* 48(6):38-43. See also: Chellaney, Brahma, 1991, "South Asia's Passage to Nuclear Power," *International Security,* 16(1):43-72. For Pakistan see: Gates, Robert M., 1992, Testimony before the U.S. Senate, Committee on Governmental Affairs, 15 January. See also: Woolsey, R. James, 1993, Testimony before the U.S. Senate, Committee on Governmental Affairs, 15 January. For all see: Spector, Leonard S. with Jacqueline R. Smith, 1990, *Nuclear Ambitions: The Spread of Nuclear Weapons 1989-1990,* Boulder: Westview.

Several impressions about perceptions of existing nuclear proliferation are evident. Among general public respondents, large majorities assumed Germany and Japan possess nuclear weapons (Germany: 78%; Japan: 66%), and more than half the respondents (53%) mistakenly identified Canada as a nuclear weapons power. Nearly half (49%) did not indicate that India possesses nuclear weapons, and 43% were unaware of Kazakhstan's nuclear capabilities. Substantial percentages, though not majorities, of both scientific communities were also at odds with consensus views about the nuclear status of Germany, Japan, Canada, and Kazakhstan.

Relating Perceptions and Knowledge of Existing Proliferation to the Likelihood of Future Proliferation

For comparative purposes, an index or score of each respondent's *perception* of the extent of horizontal nuclear proliferation among the ten subject states was created by assigning one point for each state judged by the respondent to possess nuclear weapons. A score of zero indicates a perception that none of the ten states have nuclear weapons, and a score of ten indicates a perception that all of the states possess nuclear weapons. Similarly, an index or score of each respondent's actual *knowledge* of the extent of horizontal nuclear proliferation among the ten subject states was created by assigning one point for each state correctly categorized by the respondent.[4] On this scale, a score of zero indicates the respondent was incorrect in assessing the nuclear weapons status of all ten subject states, and a score of ten represents a correct assessment for each of the ten states. The relationship between these two indices and the perceived likelihood of further spread of nuclear weapons was then analyzed using ordinary least squares multivariate regression.

When the proliferation perception index and the proliferation knowledge index are used as independent variables to explain respondent perceptions of how the breakup of the Soviet

[4] Based on strong consensus in open source literature, the following states included in the survey were categorized as having nuclear weapons capabilities: India, Kazakhstan, China, Israel, Ukraine, and Pakistan. The following states included in the survey were categorized as not having nuclear weapons capabilities: Canada, Germany, Japan, and Mexico.

Union has influenced the likelihood of further nuclear proliferation (Q-37), highly significant statistical relationships are found among all three populations, indicating that as either perception or actual knowledge of the extent of current proliferation among the ten subject states increases, so too does the perception that the breakup of the Soviet Union has increased the likelihood of further spread of nuclear weapons. Relationships and values are shown in Table 2.2, which summarizes key regression outcomes.

Table 2.2: Perception/Knowledge of Current Proliferation vs. Likelihood of Further Spread of Nuclear Weapons (Q-37)

	INDEPEND. VARIABLES	COEFF.	STD. ERROR	STD. COEFF.	t VALUE	P VALUE	ADJUST. R^2
PUBLIC	Intercept	3.90	.160	3.90	24.7	<.0001	.030
	Perception Index	.09	.027	.10	3.4	.0007	
	Knowledge Index	.11	.027	.11	3.9	.0001	
UCS	Intercept	4.00	.300	4.00	13.6	<.0001	.082
	Perception Index	.22	.038	.17	5.8	<.0001	
	Knowledge Index	.22	.033	.20	6.7	<.0001	
LABS	Intercept	5.90	.220	5.90	27.1	<.0001	.062
	Perception Index	.16	.033	.14	4.8	<.0001	
	Knowledge Index	.14	.024	.17	5.8	<.0001	

In summary, the way a respondent perceived the existing state of nuclear proliferation and how well a respondent was factually informed about existing proliferation influenced directly how that respondent judged the likelihood of further proliferation.

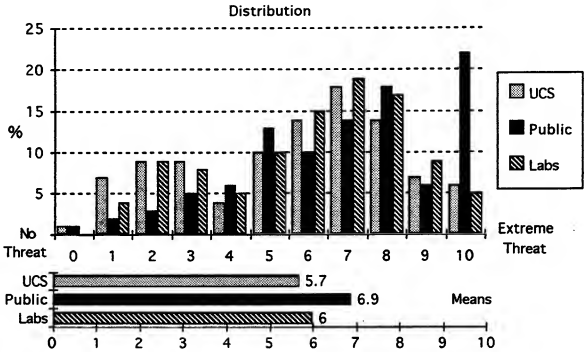
Nuclear Terrorism

Participants in each of the three focus groups evidenced concern over the possibility of nuclear terrorism. A majority of all focus group participants were of the consensus that a significant threat of a nuclear device being used for terrorist purposes exists today, and that one

or more acts of nuclear terrorism is even more likely within the next ten years. Figure 2.5 depicts respondents' perceptions of *today's* threat of nuclear terrorism occurring anywhere in the world (Q-43). Respondents answered on a ten point scale where one meant no threat and ten meant extreme threat.

Figure 2.5

Current Threat of Nuclear Terrorism (Q-43)



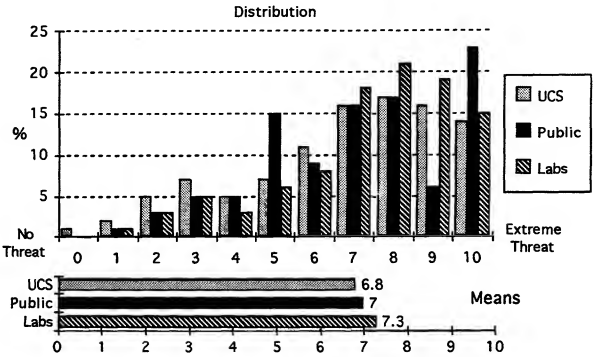
Means for all three respondent groups are significantly above mid-scale, with the two science groups assessing the threat in similar ways. Respondents in the general public group were more apprehensive about today's threat of nuclear terrorism than was either science group, with 22 percent considering nuclear terrorism to pose an extreme threat now.

When asked to assess the *future* threat of nuclear terrorism, all three groups were even more pessimistic, substantially supporting the opinion of some of the focus group participants who viewed the threat of nuclear terrorism as more a question of time than eventuality. Figure 2.6 summarizes respondents' assessments of the threat of nuclear weapons being used by terrorists anywhere in the world during the next ten years (Q-44). Again the scale used one to

represent no threat, and ten to represent extreme threat. Mean responses were tightly grouped, reflecting a consensus that nuclear terrorism poses a substantial threat in the next ten years.

Figure 2.6

Threat of Nuclear Terrorism in Next Ten Years (Q-44)



Relating Perceptions and Knowledge of Existing Proliferation to the Current and Future Threat of Nuclear Terrorism

To better understand if nuclear proliferation and nuclear terrorism were linked in the perceptions of respondent groups, the two indices representing *perception* of proliferation and *knowledge* of proliferation among the ten subject states (Q-26 - Q-35) were used as independent variables in multiple regression calculations to predict perceptions of the threat of current and future nuclear terrorism (Q-43 and Q-44). Highly significant statistical relationships were again found among all three groups. However, the two predictor variables acted in opposite directions, with increased *perceptions* of proliferation increasing the perceptions of both the current and future threat of nuclear terrorism, but with increased *knowledge* of current proliferation slightly decreasing perceptions of the current and future threat of nu-

clear terrorism. One explanation for the opposing effects may be that the more informed respondents did not perceive current nuclear weapons states as likely to promote nuclear terrorism, but no inference can be made about how informed respondents might view the relationship of new nuclear weapons states to the chances for nuclear terrorism. Key regression results are shown in Tables 2.3 and 2.4.

Table 2.3: Perception/Knowledge of Current Proliferation vs. Perception of Current Threat of Nuclear Terrorism (Q-43)

	INDEPEND. VARIABLES	COEFF.	STD. ERROR	STD. COEFF.	t VALUE	P VALUE	ADJUST. R^2
PUBLIC	Intercept	6.50	.210	6.50	30.4	<.0001	.030
	Perception Index	.22	.037	.18	6.0	<.0001	
	Knowledge Index	-.16	.037	-.13	-4.4	<.0001	
UCS	Intercept	5.20	.350	5.20	14.6	<.0001	.064
	Perception Index	.38	.046	.24	8.3	<.0001	
	Knowledge Index	-.21	.039	-.16	-5.4	<.0001	
LABS	Intercept	6.20	.310	6.20	19.6	<.0001	.034
	Perception Index	.22	.047	.14	4.8	<.0001	
	Knowledge Index	-.20	.034	-.18	-5.9	<.0001	

Table 2.4: Perception/Knowledge of Current Proliferation vs. Perceived Threat of Terrorism in Next Ten Years (Q-44)

	INDEPEND. VARIABLES	COEFF.	STD. ERROR	STD. COEFF.	t VALUE	P VALUE	ADJUST. R^2
PUBLIC	Intercept	6.50	.200	6.50	32.4	<.0001	.039
	Perception Index	.24	.034	.20	7.0	<.0001	
	Knowledge Index	-.16	.034	-.14	-4.6	<.0001	
UCS	Intercept	5.60	.340	5.60	16.8	<.0001	.043
	Perception Index	.32	.044	.22	7.3	<.0001	
	Knowledge Index	-.08	.037	-.06	-2.2	.0324	
LABS	Intercept	6.90	.280	6.90	24.3	<.0001	.019
	Perception Index	.20	.042	.14	4.8	<.0001	
	Knowledge Index	-.10	.030	-.10	-3.2	.0015	

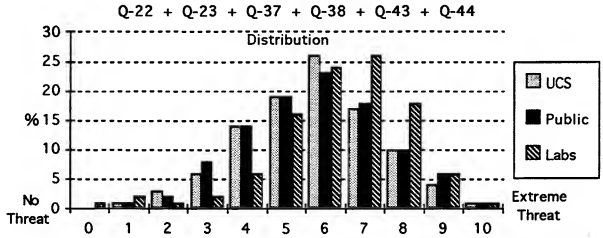
In summary, respondent *perceptions* of current proliferation influence positively their perceptions of the threat of current and future nuclear terrorism. Respondent *knowledge* of current proliferation influences negatively their perceptions of the threat of current and future nuclear terrorism. Basic relationships between these variables hold across each of the three groups.

Creating a Composite Nuclear Threat Index

By combining perceptions of the likelihood of the U.S. becoming involved in nuclear conflict (Q-22), the likelihood of nuclear war occurring between any two countries in the international system (Q-23), the likelihood of future nuclear proliferation (Q-37), the risks to the U.S. posed by further proliferation (Q-38), and the current (Q-43) and future (Q-44) threat of nuclear terrorism, a composite nuclear threat index was constructed. All three response groups perceived substantial nuclear threats to exist within the international system,

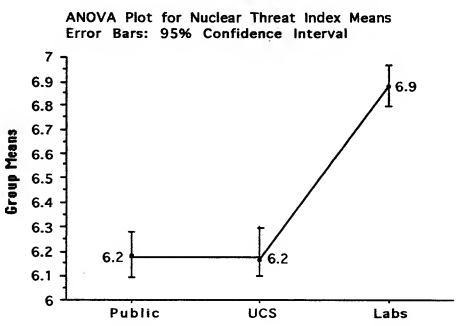
with mean responses all well above mid-scale. Figure 2.7 shows the distributions of the composite nuclear threat index. Though USNL respondents perceived the highest levels, participants from the UCS and general public samples also perceived substantial threats. Results indicate that participants from all three groups perceive the post-Cold War international environment to pose serious security concerns.

Figure 2.7: Nuclear Threat Index



Mean values and 95% confidence intervals for each group's composite nuclear threat index are compared in Figure 2.8.

Figure 2.8



Analysis of variance (ANOVA) among the three groups shows that, on average, respondents from the general public and the Union of Concerned Scientists perceived the external threat posed by nuclear weapons to be of the same magnitude, while USNL respondents perceived a significantly higher level of threat. The differences in means between the public sample and the USNL sample and between the UCS and USNL samples are both highly statistically significant, as shown in Tables 2.5 and 2.6.

Table 2.5: ANOVA for Nuclear Threat Index

	DF	Sum of Squares	Mean Square	F-Value	P-Value
Group	2	409.2	204.6	75.6	<.0001
Residual	3678	9955.5	2.7		

Model II estimate of between component variance: 1.6E-1

Table 2.6: Fisher's PLSD for Nuclear Threat Index
Significance Level: 5 %

	Mean Diff.	Crit. Diff	P-Value	
Public, UCS	2.2E-2	1.3E-1	.7366	
Public, Labs	-7.0E-1	1.3E-1	<.0001	S
UCS, Labs	-7.2E-1	1.3E-1	<.0001	S

The Persistence of Nuclear Weapons

Two questions were asked to assess how respondents perceived the possibility of eventually eliminating nuclear weapons worldwide. Each asked the participant to respond to a statement using a scale from one to seven, with one indicating strong disagreement and seven indicating strong agreement. Question 41 asked for a response to the following statement: *It is feasible to eliminate all nuclear weapons worldwide within the next 25 years.* Question 42 asked for a response to the following: *Even if all the nuclear weapons could somehow be eliminated worldwide, it would be extremely difficult to keep other countries from building them again.* Results to each are presented in Figures 2.9 and 2.10.

Figure 2.9

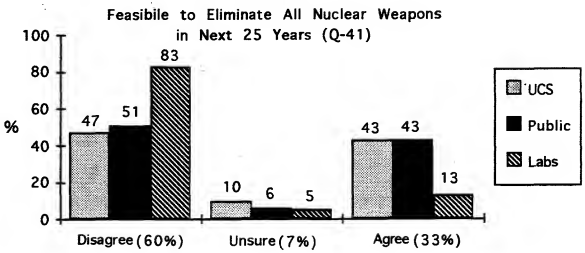
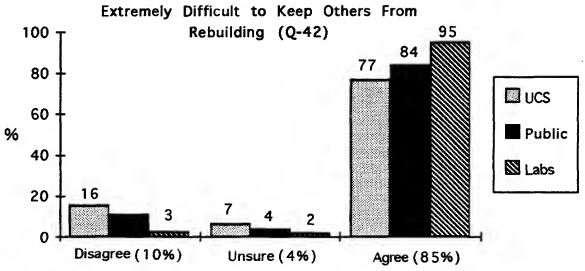


Figure 2.10



Responses from each of the three groups indicated general agreement that nuclear weapons are likely to persist for the next 25 years or more. There were high levels of intergroup agreement that even if nuclear weapons were to be eventually eliminated, it would be very difficult to insure no one built them again. From these responses, it appears that all three populations consider nuclear weapons to be a fact of international life for the foreseeable future.

SECTION 2.3: SUMMARIZING POST-COLD WAR SECURITY PERCEPTIONS

Respondents appear to perceive the post-Cold War security environment to have significantly changed, but not to have become substantially less dangerous. Our initial focus groups indicated that the dangers of East-West ideological rivalry are seen to have been replaced with ethnic conflict, economic turmoil, and strategic uncertainty. The surveys confirmed that in the views of all three respondent groups, the breakup of the Soviet Union has not significantly reduced the likelihood of nuclear war; in fact, all three groups perceived the likelihood of international nuclear war, the likelihood of increased nuclear proliferation, and the likelihood of nuclear terrorism all to have increased. There was considerable agreement about increased risks posed to the U.S. by further spread of nuclear weapons, yet many respondents in all three groups were unsure exactly who has nuclear weapons today. Respondents seemed almost fatalistic about the likelihood of nuclear terrorism occurring sometime in the future, but were much less clear about how the dynamics of nuclear proliferation and nuclear terrorism may be linked. Most respondents did not think it is feasible to eliminate nuclear weapons in the foreseeable future, and felt that even if nuclear weapons were somehow eliminated, it would be very difficult to prevent them being rebuilt somewhere in the international system. The picture is one of a changed but still dangerous international environment in which nuclear arsenals are a fact of life and a source of continuing concern.

CHAPTER THREE:

RISK PERCEPTIONS OF NUCLEAR WEAPONS

SECTION 3.1: PLACING THE RISKS OF NUCLEAR WEAPONS IN PERSPECTIVE

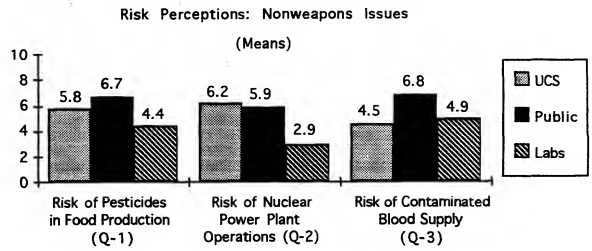
In order to better understand perceptions of risks associated with nuclear weapons, three sets of questions were employed to create a broader context indicating the relative weight of nuclear and nonnuclear risks, and to compare risk sensitivity of respondent groups.

First, to provide a generalized baseline for risk sensitivity, respondents were asked to rate their perceptions of the risks associated with the use of pesticides in food production (Q-1), the operation of nuclear power plants (Q-2), and the contamination of the U.S. blood supply (Q-3). Second, to provide an index of risk perceptions concerning domestic management of U.S. nuclear weapons, respondents expressed their perceptions of risks associated with six separate but related nuclear arsenal management functions, and their assessment of the likelihood of accidental or unauthorized use of a U.S. nuclear weapon. Respondents were also asked questions concerning the risks of nuclear radiation and their perceptions of the risks associated with long-term storage of nuclear materials. Third, to provide a direct comparative context, respondents were asked to rank four nonnuclear and one nuclear weapons issue in terms of relative importance. The issues were global warming, illegal drug trafficking, the AIDS epidemic, the spread of nuclear weapons, and world hunger.

Establishing a Risk Baseline

A comparison of mean responses of each of the three respondent groups for three nonweapons baseline questions is shown in Figure 3.1 below. Each question used a continuous scale from zero to ten, with zero representing no risk and ten representing extreme risk.

Figure 3.1



Overall, respondents from the general public evidenced a relatively high perception of risk across all three baseline questions. Nevertheless, for the public respondents, the risks from nuclear power plant operations ranked last, behind risks from contaminated blood supplies or pesticides. For the question relating to nuclear power production, respondents from the national laboratories reflected a substantially lower perception of risks than did either the general public or the other group of respondents formally trained in the sciences. Only among the UCS respondents did risks from nuclear power plant operations rank first among these three types of potential hazards.

Risk Perceptions of Managing Nuclear Weapons

Using the same ten point scale where zero meant no risk and ten meant extreme risk, respondents were asked to assess the levels of risk involved with a variety of functions related to managing nuclear weapons. These included the manufacture, testing, transporting, storing, disassembly, and storage of radioactive materials from nuclear weapons. Comparative mean responses are shown in Figures 3.2 to 3.7. Note that mean perceptions of risks among USNL participants were roughly half the magnitude of those perceived by respondents from the general public and the UCS.

Figure 3.2

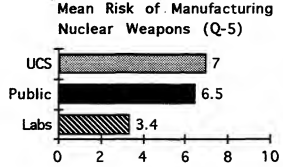


Figure 3.3

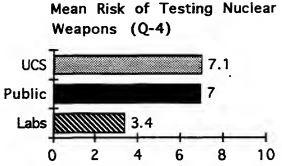


Figure 3.4

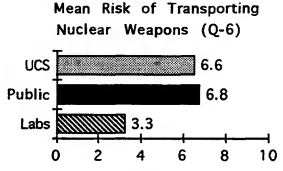


Figure 3.5

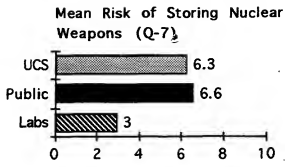


Figure 3.6

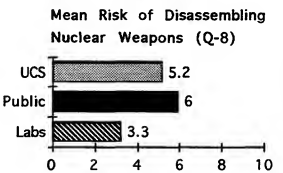
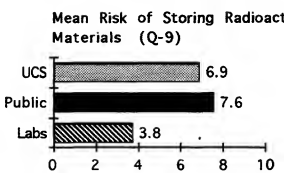


Figure 3.7



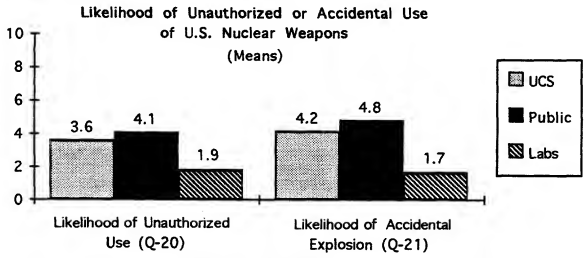
Risk sensitivity within both the general public and UCS respondent groups to non-weapons issues related directly to perceptions of risks associated with each aspect of nuclear weapons management at a statistically significant level. Sensitivity within the group of national laboratory respondents to the risks of pesticides and to the risks of nuclear power plants was also significantly related to risk perceptions of nuclear weapons management. However the association among lab respondents between the risks of a contaminated blood supply and nuclear

weapons was inconsistent, showing statistical significance only to testing and disassembling nuclear weapons.

Perceived Risks of Accidental or Unauthorized Use

Two questions inquired about respondent perceptions of the likelihood that U.S. nuclear weapons might be used without legal authorization or that a U.S. nuclear weapon might be detonated accidentally. Respondents were asked to indicate on a scale from one to ten, where one meant not at all likely and ten meant highly likely, their perception of the likelihood of a U.S. nuclear weapon being used within the next 25 years without presidential authorization (Q-20). Using the same scale, respondents were asked to rate the likelihood of an accident involving a U.S. nuclear weapon causing an unintended nuclear explosion (Q-21). Comparative mean results for both questions are shown in Figure 3.8.

Figure 3.8



While on average all three groups rated the likelihood of either event at less than mid-scale, significant differences in perceptions were apparent between the views of public and UCS respondents as compared to those of USNL participants. Perceptions of the likelihood of each event by the UCS and public groups were approximately twice those of lab respondents. One plausible explanation is that USNL participants may have been better informed about nuclear weapons design features, safeguards, and operational procedures than were the other two

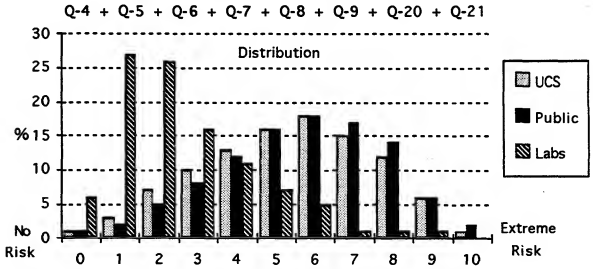
groups. It might be inferred that more complete information about nuclear surety measures may reduce perceived risks of accidental or unintended use of nuclear weapons. Another possible explanation is that differences in ideological or cultural belief systems affect perceived risks, and that these belief systems differ systematically across scientific groups.[5]

Constructing a Nuclear Weapons Management Risk Index

If responses to the six nuclear weapons management questions and the two questions dealing with accidental or unauthorized use are combined, a nuclear weapons management risk index for each group can be developed. The distribution for each of the three groups' risk index, calculated by averaging the combined responses to questions 4, 5, 6, 7, 8, 9, 20, and 21 is shown below in Figure 3.9. Zero represents no risk, and ten represents extreme risk.

Figure 3.9

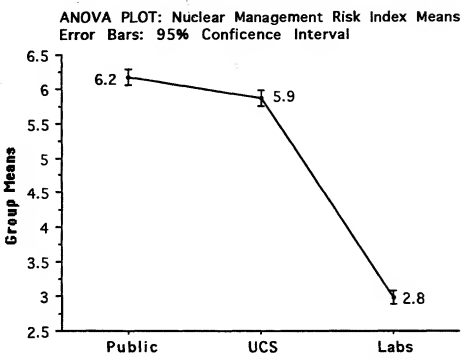
Nuclear Weapons Management Risk Index



Mean values and 95% confidence intervals for each group's nuclear weapons management risk index are compared in Figure 3.10.

[5] This proposition will be tested in later research.

Figure 3.10



Analysis of variance (ANOVA) among the means of the respective groups indicates that the differences in means between the public and the USNLs, the public and the UCS, and the USNLs and the UCS are all highly statistically significant, as shown in Tables 3.1 and 3.2 below.

Table 3.1: ANOVA Table for Nuclear Management Risk Index

	DF	Sum of Squares	Mean Square	F-Value	P-Value
Group	2	7649.3	3824.6	981.3	<.0001
Residual	3676	14327.0	3.9		

Model II estimate of between component variance: 3.1

Table 3.2: Fisher's PLSD for Nuclear Management Risk Index
Significance Level: 5 %

	Mean Diff.	Crit. Diff	P-Value	
Public, UCS	3.1E-1	1.6E-1	.0001	S
Public, Labs	3.2	1.5E-1	<.0001	S
UCS, Labs	2.9	1.6E-1	<.0001	S

These comparisons illustrate that each of the respondent populations had a separate and distinctive perception of the risks inherent in developing and maintaining a nuclear arsenal,

that respondents from the general public perceived the highest risk overall, followed by respondents from the UCS, and that participants from the national laboratories judged the combined risks to be lowest.

SECTION 3.2: RELATING RISK PERCEPTIONS TO ISSUE COMPETENCY

Respondents from each of the two science groups were asked to rate their own level of knowledge concerning national security issues (Q-89) and their scientific knowledge of nuclear technology (Q-90); respondents from the general public sample were not asked either question. Ordinary least squares bivariate regression using each question separately as an independent variable to predict the nuclear weapons management risk index, discussed in Section 3.1 and shown in Figures 3.9 and 3.10 above, indicates a statistically significant relationship between the self-assessed level of knowledge of national security issues and risk perceptions among national lab respondents, but not among UCS participants. However a statistically significant relationship was found between level of self-assessed scientific knowledge about nuclear technology and risk perceptions among both UCS and national lab respondents.

Table 3.3 summarizes the results of using the respondent's self-rated knowledge of national security issues (Q-89) as an independent variable to explain perception of risk.

Table 3.3: Knowledge of National Security Issues (Q-89) vs. Perception of Risk

	INDEPEND. VARIABLE	COEFF.	STD. ERROR	STD. COEFF.	t VALUE	P VALUE	ADJUST. R^2
UCS	Intercept	6.20	.210	6.20	29.7	<.0001	N/A
	Know. of Nat'l. Sec. Issues	-.08	.045	-.05	-1.7	. 0824	
LABS	Intercept	4.30	.170	4.30	26.1	<.0001	.056
	Know. of Nat'l. Sec. Issues	-.30	.036	-.24	-8.3	<.0001	

For respondents from the UCS, self-rated level of knowledge about national security issues was not statistically significant at the 95% confidence level. For respondents from the national laboratories, as knowledge about national security issues increased by one point, risk perception decreased by 0.3 points.

Turning to the second measure of self-assessed issue competency, Table 3.4 shows the results of bivariate regressions among both science groups in which self-rated knowledge of nuclear technology was used as an independent variable to explain perceptions of risk.

Table 3.4: Scientific Knowledge About Nuclear Technology (Q-90) vs. Perception of Risk

	INDEPEND. VARIABLE	COEFF.	STD. ERROR	STD. COEFF.	t VALUE	P VALUE	ADJUST. R^2
UCS	Intercept	6.60	.190	6.60	34.5	<.0001	.013
	Scien. Know. of Nuc. Tech.	-.16	.041	-.12	-4.0	<.0001	
LABS	Intercept	5.00	.170	5.00	28.9	<.0001	.110
	Scien. Know. of Nuc. Tech.	-.40	.033	-.33	-12.1	<.0001	

Scientific knowledge of nuclear technology proved to be a stronger predictor of risk perception among both science groups than was knowledge of national security issues. For the UCS, as self-rated scientific knowledge of nuclear technology increased one point on a seven point scale, respondent perception of the risks of managing nuclear weapons, expressed on a ten point risk index, decreased by 0.16 points. For national lab participants, as scientific knowledge of nuclear technology increased by one point, risk perception decreased by 0.4 points.

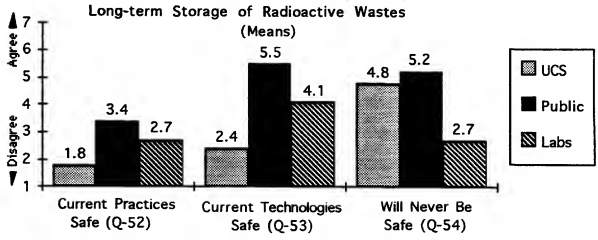
These results indicate a small but statistically significant inverse relationship between respondent self-rated level of knowledge or competence about nuclear technology and respondent perceptions of risks associated with the various stages and processes involved in managing a

nuclear arsenal. One implication suggested is that as people become better informed about nuclear technology, perceptions of associated risks decrease.

SECTION 3.3: RADIOACTIVITY AND RISK PERCEPTIONS

Historically, general public sensitivity to radioactive characteristics of nuclear materials used in weapons production and the generation of electrical power has at times been acute, and current and future options for long-term storage of nuclear materials remain high profile public policy issues. Four questions inquired directly about respondent perceptions of the storage issue. Three of them asked respondents to indicate their reactions to statements about nuclear materials storage on a seven point scale where one meant they disagreed strongly and seven meant they agreed strongly with a given statement. In Question 52, they were asked to respond to the following statement: *Current U.S. practices are adequate for safe long-term storage of radioactive wastes.* Question 53 asked their response to: *Current technologies are adequate for safe long-term storage of radioactive wastes.* And in Question 54, participants were asked to respond to the following: *The long-term storage of radioactive wastes will never be safe.* Comparative mean responses to each of the questions are shown in Figure 3.11 below.

Figure 3.11

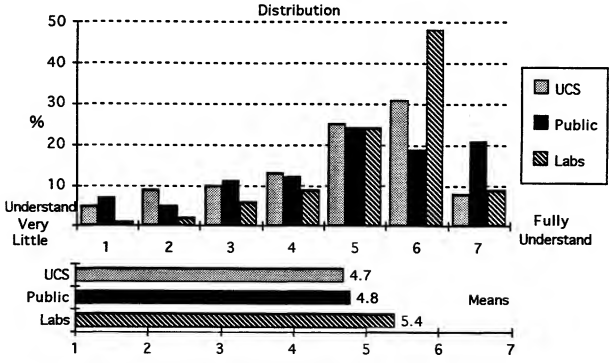


On average, each respondent group rated current technologies for storing radioactive wastes higher than current storage practices. This seems to indicate that each group placed more confidence in available technologies than in responsible agencies for implementing the technologies. Both the general public group and the UCS group were pessimistic that long-term storage of radioactive materials will ever be made acceptably safe. USNL respondents were more optimistic about long-range prospects. The composite picture is one in which none of the respondent groups were substantially satisfied with current long-term storage practices, and the public and UCS groups were doubtful that radioactive waste storage will ever be safely managed.

Question 55 asked respondents to assess how well they thought nuclear experts understood the risks of nuclear radiation (Figure 3.12). On this scale, one meant the experts understand very little, and seven meant they fully understand the risks of nuclear radiation.

Figure 3.12

Experts' Understanding of Nuclear Radiation (Q-55)



Results indicate that respondents from all three groups have considerable faith in the technical knowledge of nuclear "experts" to understand radiation, but skepticism is also present among all populations. In general, respondents from the national laboratories placed somewhat more confidence in existing science about nuclear radiation, while their counterparts among the UCS and members of the lay public both evidenced somewhat less trust in nuclear expertise.

The two scientifically trained groups were given an additional opportunity to express their understanding of radiation and how it might affect society. The sparse and uncertain evidence regarding the effects of radiation on the incidence of cancer was used as a domain for inquiring into prevailing scientific opinion concerning the effects of radiation. Studies of the relationship between radiation dose and incidence of cancer have had to rely on incomplete data. In particular, data on the low dose effects are statistically inconclusive, with several possible kinds of relationships having been hypothesized:

(1) a LINEAR RELATIONSHIP: low-dose effects of radiation are assumed to be proportionate to high-dose effects.

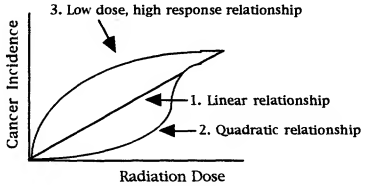
(2) a QUADRATIC RELATIONSHIP: effects of radiation at low doses are minimal below some threshold. (This is also sometimes referred to as a linear-quadratic relationship, because it may be linear in some ranges.)

(3) a LOW-DOSE, HIGH RESPONSE RELATIONSHIP: effects of radiation are assumed to be proportionately higher at low dose ranges.

These possible relationships are illustrated in Figure 3.13.

Figure 3.13

Hypothetical Relationships of Radiation Exposure to Incidence of Cancer



Each respondent in the two scientific groups was then asked which of the three hypothesized relationships they thought was most "correct" (Q-102) and which should be assumed for purposes of setting public safety standards for managing radioactive materials (Q-103). Results are presented in Figures 3.14 - 3.17.

Figure 3.14

UCS: Most Likely Relationship

(Q-102)

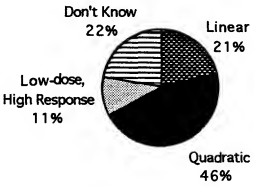


Figure 3.15

Labs: Most Likely Relationship

(Q-102)

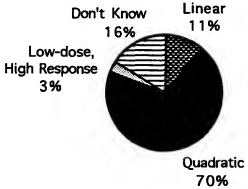


Figure 3.16

UCS: Preferred Standard for Public Safety (Q-103)

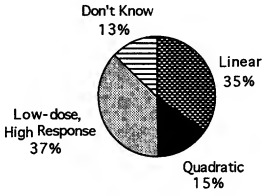
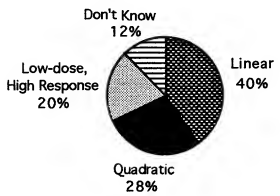


Figure 3.17

Labs: Preferred Standard for Public Safety (Q-103)



Note that even though a plurality of respondents from each science group thought that the interaction between radiation dose and incidence of cancer is probably a quadratic relationship, where increasing doses of radiation exposure do not significantly affect the incidence of cancer until a threshold effect is reached, only 15% of UCS respondents and only 28% of respondents from the national laboratories thought public safety standards should be based on the quadratic relationship. The large majority of each group preferred to base public policy on one or the other of the two relationships they considered less likely to be correct, but which provide greater margins of safety. This indicates that an important aspect of scientific opinion about the relationship of exposure to radiation and incidence of cancer in humans and other organisms is not precise and lacks strong consensus, and that, in the face of scientific uncertainty about radiation, technically trained respondents in both groups prefer to err on the side of public safety.

Taken together, the set of questions on nuclear radiation may indicate somewhat different perspectives among all three groups. First, a substantial number of respondents from the general public indicated they believe that the technology exists to make long-term storage of radioactive nuclear materials reasonably safe, but that current practices are inadequate. At the same time, the public respondents seemed to evidence real concern about the long-term dangers of such materials, and were concerned that nuclear materials may be stored in ways that could

be dangerous to future generations. They also seemed, on average, willing to look to experts in nuclear technology for solutions to the storage problem. Secondly, members of the UCS, some of whom have training in related technologies, were more pessimistic both about current practices and potential technological solutions to the long-term storage problem. UCS members, on average, were also less willing to trust nuclear experts. Third, respondents from the national laboratories, many of whom have technical training in related fields, evidenced a cautious, but hopeful attitude about technology and nuclear specialists eventually dealing successfully with storage issues. Finally, both scientific groups preferred to use conservative standards when establishing public policy about nuclear safety, though this tendency is much more pronounced among the UCS respondents.

SECTION 3.4: RELATIVE RISKS

Respondents were also asked to place a nuclear weapons related issue in perspective with competing issues having two common features. Each had the potential for influencing international populations, and each was unlikely to be solved by any single state. Respondents were asked to rank in order of relative importance the following five issues: global warming; illegal drug trafficking; the AIDS epidemic; the spread of nuclear weapons; and world hunger. Relative issue priority for each group is shown in Figures 3.18 - 3.20 by the percent of respondents who chose each issue as the most important among the five choices. (Note: These displays do not reflect respondents' first priority of all possible issues; several participants added comments about other issues such as overpopulation.)

Figure 3.18

UCS: Highest Priority (Q-25)

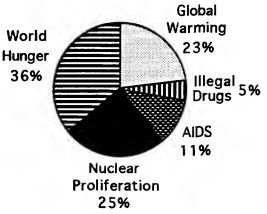


Figure 3.19

Labs: Highest Priority (Q-25)

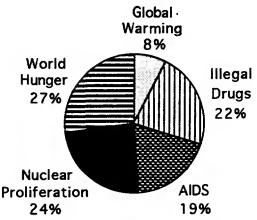
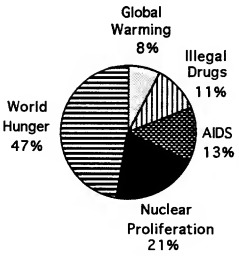


Figure 3.20

Public: Highest Priority (Q-25)



Of the issues compared, all three respondent groups placed the spread of nuclear weapons second in priority only to world hunger. The range of respondents choosing nuclear proliferation as the most important of the five issues varied within a narrow range from 21 to 25 percent, reflecting similar judgments among all three groups.

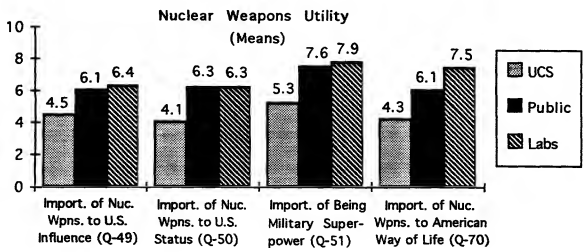
CHAPTER FOUR:

PERCEPTIONS OF THE UTILITIES AND BENEFITS OF NUCLEAR WEAPONS

SECTION 4.1: PERCEPTIONS OF THE HISTORICAL ROLE OF NUCLEAR WEAPONS

The most significant rationale for U.S. nuclear weapons has historically been their utility for achieving national security interests. Three questions dealing with the role of nuclear weapons in U.S. international relationships were asked in order to better understand contemporary perceptions of the utility of nuclear weapons for achieving U.S. interests. Respondents were asked to rate the importance of nuclear weapons for U.S. influence over international events (Q-49), the importance of nuclear weapons for U.S. status as a world leader (Q-50), and they were asked to evaluate the importance of the U.S. remaining a military superpower (Q-51). Finally, respondents were asked to assess the importance of nuclear weapons to preserving the "American way of life" during the past four decades (Q-70). Answers were expressed on a scale where zero meant no importance and ten meant extreme importance. Mean responses to each of the four questions are shown for each group in Figure 4.1.

Figure 4.1

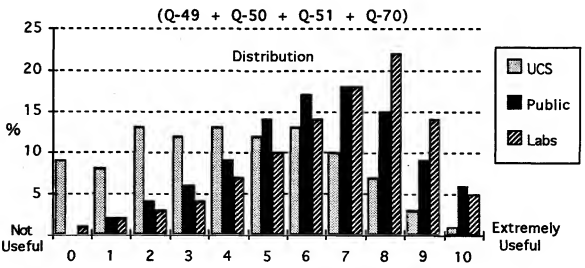


In each case, members of the Union of Concerned Scientists (UCS) perceived, on average, less utility of nuclear weapons for achieving U.S. national interests than did either the general public or respondents from the national laboratories. In the first three questions, average public evaluations and average laboratory personnel responses were of similar magnitudes. The largest differences in perceptions among all three groups were found in the respective mean assessments of how important nuclear weapons have been thus far to preserving the American way of life. Here, respondents from national laboratories perceived nuclear weapons to have the highest saliency, with the general public perceiving considerable, though somewhat lower, utility of nuclear weapons, and UCS respondents placing the value of nuclear weapons for preserving the American way of life at less than mid-scale, the lowest of all three groups.

If responses to this set of questions are combined, a utility index for each group can be developed. The distribution for each group's nuclear weapons utility index, calculated by averaging the combined responses to questions 49, 50, 51, and 70, is shown in Figure 4.2 below.

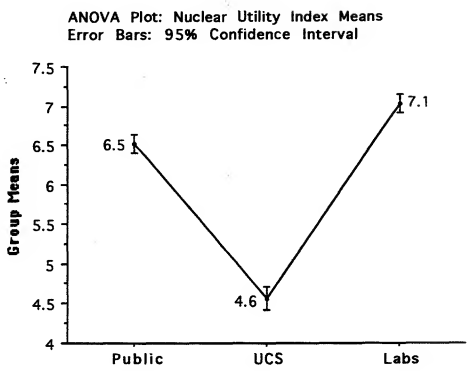
Figure 4.2

Nuclear Utility Index



Mean values with 95% confidence intervals for each group's nuclear weapons utility index are compared in Figure 4.3.

Figure 4.3



Analysis of variance (ANOVA) among the means of the respective groups indicates that the differences in means between the public and the labs, the public and the UCS, and the labs and the UCS are all highly statistically significant, as shown in Tables 4.1 and 4.2 below.

Table 4.1: ANOVA for Nuclear Utility Index

	DF	Sum of Squares	Mean Square	F-Value	P-Value
Group	2	3977.5	1988.8	385.2	<.0001
Residual	3670	18947.7	5.2		

Model II estimate of between component variance: 1.6

Table 4.2: Fisher's PLSD for Nuclear Utility Index
Significance Level: 5 %

	Mean Diff.	Crit. Diff	P-Value	
Public, UCS	2.0	1.8E-1	<.0001	S
Public, Labs	-5.0E-1	1.8E-1	<.0001	S
UCS, Labs	-2.5	1.8E-1	<.0001	S

SECTION 4.2: RELATING UTILITY PERCEPTIONS TO ISSUE COMPETENCY

In section 3.2, self-rated knowledge of national security issues (Q-89) and self-rated scientific knowledge about nuclear technology (Q-90) were used to examine the relationship between issue knowledge or competency and perceptions of risk. In this section the same two questions are also used to explore the relationship between issue competency and perceptions of the benefits or utilities of nuclear weapons. Again, ordinary least squares bivariate regression was employed, and each question was used separately as an independent variable to predict the nuclear weapons utility index described in Section 4.1 above. Table 4.3 summarizes the statistical relationship between knowledge of national security issues (Q-89) and perceptions of utility.

Table 4.3: Knowledge of National Security Issues (Q-89) vs. Perception of Nuclear Weapons Utility

	INDEPEND. VARIABLE	COEFF.	STD. ERROR	STD. COEFF.	t VALUE	P VALUE	ADJUST. R^2
UCS	Intercept	4.90	.250	4.90	19.4	<.0001	N/A
	Know. of Nat'l. Sec. Issues	-.08	.055	-.04	-1.5	. 1363	
LABS	Intercept	5.50	.200	5.50	27.8	<.0001	.051
	Know. of Nat'l. Sec. Issues	.34	.042	.23	8.1	<.0001	

For respondents from the UCS, there is no discernible relationship between knowledge of security issues and perceptions of the utilities of nuclear weapons. For personnel from the participating national laboratories, a highly statistically significant relationship exists such that as lab respondent self-rated knowledge of national security issues increased one point on a seven point scale, perception of the utility of nuclear weapons increased by 0.34 points.

Using the second measure of competency, statistically significant relationships among both groups exist between self-rated scientific knowledge of nuclear technology and perceptions of utility. Table 4.4 summarizes the statistical results.

Table 4.4: Scientific Knowledge About Nuclear Technology (Q-90) vs. Perception of Nuclear Weapons Utility

	INDEPEND. VARIABLE	COEFF.	STD. ERROR	STD. COEFF.	t VALUE	P VALUE	ADJUST. R^2
UCS	Intercept	5.20	.230	5.20	22.4	<.0001	.007
	Scien. Know. of Nuc. Tech.	-.15	.049	-.09	-2.9	.0033	
LABS	Intercept	5.70	.210	5.70	26.6	<.0001	.034
	Scien. Know. of Nuc. Tech.	.27	.041	.19	6.6	<.0001	

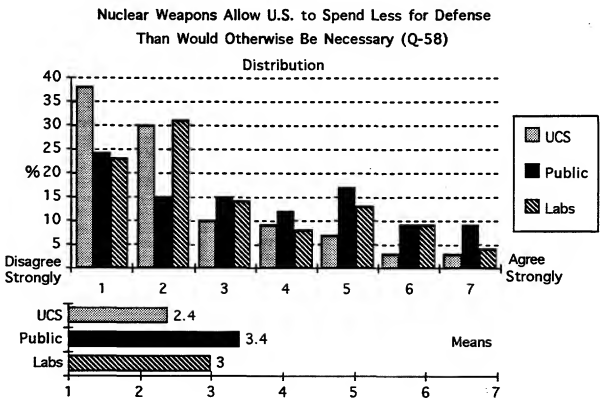
Among UCS respondents, as self-rated scientific knowledge of nuclear technology increased by one point, perceptions of the utility of nuclear weapons decreased by 0.15 points, while among lab respondents, as knowledge of nuclear technology increased one point, perceptions of nuclear utility increased by 0.25 points. Thus level of understanding of nuclear technology operated in opposite directions for each of the two science groups. While the relationship is considerably stronger among the lab participants, both relationships are statistically significant, and they illustrate how technical information may be interpreted differently among competent scientists. In relating issue competency to perceptions of risk, the relationships were consistent; in the case of relating issue competency to perceptions of utility, the results are mixed and contradictory. It should also be noted that other personal or belief system variables may be exerting much stronger influence than issue saliency in the utility calculations of both groups.

SECTION 4.3: OTHER NUCLEAR WEAPONS BENEFITS

Cost Effectiveness of Nuclear Weapons

Some defense analysts have argued that having a nuclear arsenal means the U.S. can spend less on other types of forces such as tanks, airplanes, and ships. Other analysts have disagreed, pointing to the direct and indirect costs of maintaining a nuclear arsenal and the delivery vehicles and support systems associated with nuclear capabilities. Using a scale from one to seven, where one meant strong disagreement, and seven meant strong agreement, participants were asked to respond to the following statement: *Having a nuclear arsenal means the U.S. can spend less for national defense than would be necessary without nuclear weapons* (Q-58). The distributions and means of responses from the UCS, public, and USNL samples are shown in Figure 4.4.

Figure 4.4



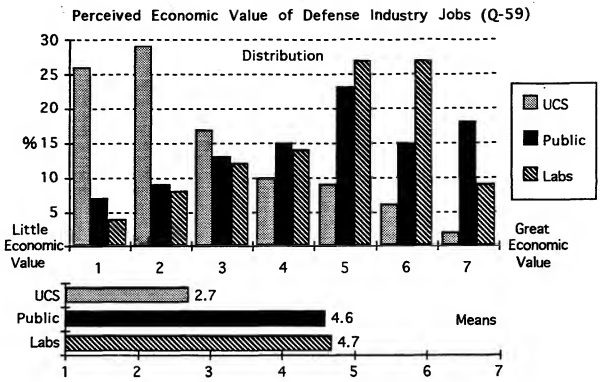
On average, none of the three groups perceived a strong relationship to exist between maintenance of a nuclear arsenal and lowered defense spending for conventional forces. This is not to suggest that respondents did not differentiate between nuclear and conventional capabilities and associated costs, just that they did not perceive a strong trade-off between them. Nuclear weapons did not appear to be associated with overall defense efficiencies in the view of any of the three respondent groups.

Defense Industry Employment

The relationship between defense spending and associated economic impacts, such as jobs, is also a matter of debate. Some analysts point out that defense industries create large numbers of jobs for American workers, and that public and congressional concern over base restructuring and the ongoing defense "build-down" indicate a clear link between defense spending, jobs, and economic benefit. Others argue that defense related spending creates jobs which are less economically productive than is nondefense employment.[6] To gain some indication of perceptions of the economic utility of defense related employment, each group of respondents was asked to evaluate the economic value of defense industry jobs in America on a scale from one to seven, where one meant defense industry jobs are of little economic value, and seven meant that they are of great economic value (Q-59). Results are displayed in Figure 4.5.

[6] For contrasting views of the economic influences of defense expenditures see: Kennedy, Paul, 1987, *The Rise and Fall of the Great Powers: Economic Change and Military Conflict from 1500 to 2000*, New York: Random House. Friedberg, Aaron, L., 1991, "The Political Economy of U.S. National Security Policy," in *U.S. National Security Strategy for the 1990s*, edited by Daniel J. Kaufman, David S. Clark, and Kevin P. Sheehan, Baltimore: Johns Hopkins University. Russett, Bruce, 1991, "Defense Expenditures and National Well-Being," and Stephen Gill and David Law, "Military-Industrial Rivalry in the Global Political Economy, both in *International Political Economy: A Reader*, edited by Kendall W. Stiles and Tsuneo Akaha, New York: HarperCollins.

Figure 4.5

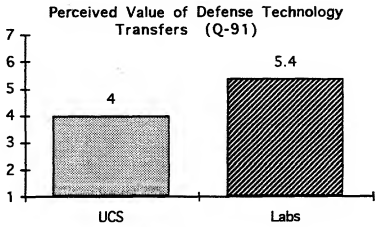


Substantial differences are apparent in perceptions of respondents from the Union of Concerned Scientists compared to those from the lay public and national laboratories. The distribution patterns for the two scientist groups are almost opposite images, with UCS respondents assigning little economic value to defense related jobs, and national lab respondents perceiving substantial economic value. General public respondents also consider defense related jobs to be economically important.

Defense Technology Transfers

Because of the two science groups' technical qualifications, they were also asked to judge the value of defense related technology developments and transfers to other areas of the U.S. economy (Q-91). Using a scale from one to seven, where one meant that defense related technologies are of little value to other areas of the U.S. economy, and seven meant that they are of great economic value, the two groups perceived the benefits of defense technology transfers differently, as shown in Figure 4.6.

Figure 4.6

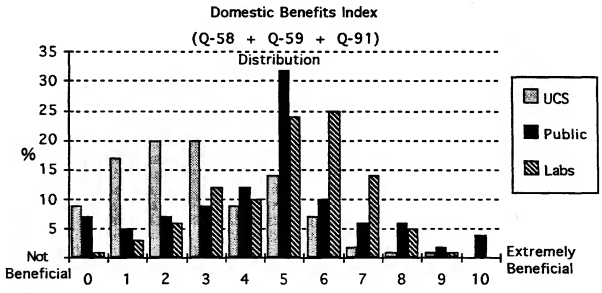


UCS participants rated the value of defense technology transfers exactly at mid-scale, while USNL respondents placed their value 27 percent higher at 5.4.

Creating a Domestic Benefits Index

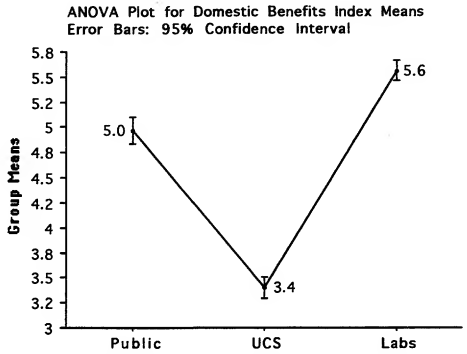
By combining perceptions of the cost effectiveness of nuclear weapons for national security purposes, the benefits of defense related employment, and the economic value of defense related technology transfers, an index reflecting respondent perceptions of the domestic benefits of nuclear weapons was constructed. As shown in Figure 4.6, group perceptions were substantially different.

Figure 4.7



Mean values with 95% confidence intervals for each group's domestic benefits index are compared in Figure 4.7.

Figure 4.8



Analysis of Variance (ANOVA) among the response group means indicates that the differences between the public and the USNLs, the public and the UCS, and the USNLs and the UCS are all highly statistically significant, as shown in Tables 4.5 and 4.6.

Table 4.5: ANOVA for Domestic Benefits Index

	DF	Sum of Squares	Mean Square	F-Value	P-Value
Group	2	2936.3	1468.2	355.5	<.0001
Residual	3620	14948.5	4.1		

Model II estimate of between component variance: 1.2

Table 4.6: Fisher's PLSD for Domestic Benefits Index
Significance Level: 5 %

	Mean Diff.	Crit. Diff	P-Value	
Public, UCS	1.6	1.6E-1	<.0001	S
Public, Labs	-5.9E-1	1.6E-1	<.0001	S
UCS, Labs	-2.2	1.6E-1	<.0001	S

When combined with the previously shown ANOVA for mean perceptions of nuclear utility, these comparisons illustrate that each of the respondent groups had a distinctly different perception of the utilities and benefits accruing from U.S. nuclear weapons. Respondents from the USNLs perceived the highest overall utilities and benefits, followed by respondents from the general public, and participants from the UCS judged the gains from nuclear weapons to be the lowest.

SECTION 4.4: COMPARING PERCEPTIONS OF THREAT, RISK, UTILITY, AND DOMESTIC BENEFITS ASSOCIATED WITH NUCLEAR WEAPONS

Table 4.5 contrasts intergroup perceptions which might be integral to individual risk/benefit evaluations of nuclear weapons by showing mean group perceptions of composite indices reflecting four areas of respondent evaluation: (1) international threats posed by nuclear weapons; (2) risks associated with maintaining a nuclear arsenal and managing nuclear weapons on a continuing basis; (3) the utility of nuclear weapons for achieving U.S. national security interests; and (4) domestic economic benefits associated with nuclear weapons. The four composite indices were constructed using scales from 0 to 10, and for comparative purposes, mean responses between 0 and 3.5 are characterized as "very low"; those between 3.5 and 5.0 are considered "low"; those between 5.0 and 6.5 are rated "high"; and those between 6.5 and 10 are termed "very high".

Table 4.7: Relative Nuclear Perception Matrix

	External Nuclear Threats	Nuclear Weapons Management Risks	Utility for Nat'l. Security	Domestic Benefits
UCS	High (6.2)	High (5.9)	Low (4.6)	Very Low (3.4)
Public	High (6.2)	High (6.2)	High (6.5)	Mid-point (5.0)
Labs	Very High (6.9)	Very Low (3.0)	Very High (7.0)	High (5.6)

UCS respondents perceived high external threats posed by nuclear weapons under the control of others, yet saw low utility of U.S. nuclear weapons for achieving national security interests. That seems to imply a weak valuation of the deterrent effects of nuclear weapons. Similarly, UCS participants perceived high levels of risk associated with managing the U.S. nuclear arsenal and very low domestic economic benefits associated with defense related programs.

Participants from the general public viewed external threats to be high, but also judged the utility of nuclear weapons for national security to be even higher. Risks associated with nuclear weapons management were also rated high, and domestic economic benefits were placed at mid-scale. Thus public respondents saw threats and risks of nuclear weapons to be more in balance with perceived utilities and benefits than did UCS respondents.

USNL participants considered both the threat posed by others' nuclear arsenals and the utility provided by U.S. nuclear resources to be very high, implying significant deterrent value. They considered the risks of managing nuclear weapons to be very low, and the domestic economic benefits to be high.

These results indicate that perceptions of the negative and positive attributes of nuclear weapons were evaluated quite differently by all three groups, with the two science populations tending to rate nuclear weapons attributes either higher or lower than participants from the general public. Overall, general public respondents rated threats and risks associated with nuclear weapons more nearly like UCS participants, and they saw utilities and benefits associated with nuclear weapons more nearly like USNL respondents. In only one case, nuclear weapons management risks, did members of the general public rate nuclear weapons attributes (on average) either higher or lower than both science groups.

CHAPTER FIVE

TRUST

SECTION 5.1: CONCEPTUALIZING TRUST

Trust is a multidimensional concept which may be linked in critical ways to how risks and benefits of nuclear weapons are perceived. The degree of trust held in institutions charged with developing, managing, safeguarding, and potentially employing nuclear weapons is likely to influence perceptions of risks associated with their nuclear responsibilities. Similarly, the benefits expected from nuclear capabilities are also likely to be influenced by the trust placed in the institutions charged with using nuclear capabilities to produce expected utilities.

It is also likely that trust varies along dimensions affording related but differentiated meanings to the concept. For example, trust in institutions charged with managing nuclear weapons could incorporate a dimension related to the institution's *potential* to perform its nuclear duties. Another dimension of trust may be related to perceptions of whether the institution has performed its duties in acceptable ways in the *past*, and can be expected to do so in the future. Another dimension of trust could reflect expectations as to whether or not the institution will be forthright in providing *reliable information* from which public judgments can be made about institutional performance. Another dimension might relate to the *fiduciary* performance of the institution, or the degree to which it is perceived to use public resources responsibly and effectively. Other dimensions of trust in an institution might relate to its *employment practices* and relations with its employees, or the degree to which it is perceived to be *accessible* by the public, or yet another might relate to its perceived *responsiveness* to public concerns and preferences.

A separate aspect of public trust in the management of nuclear weapons stems from the nature of the consequences which could result from a single serious error or nuclear

accident. The *fragility* of trust may be such that strong levels of trust, based on decades of near accident-free performance, could be shattered by one nuclear catastrophe. Similarly, the *resiliency* of trust may be such that one high consequence event could exceed the capacity for public confidence to ever be rebuilt to pre-event levels.

Public trust in the U.S. nuclear weapons establishment is also complicated by legitimate requirements for restricting data and information which might be used by others to threaten U.S. interests. Many of the institutions charged with managing nuclear weapons capabilities are severely constrained by law in terms of the information they can and should provide the public. Yet in a relatively open society such as the U.S., if citizens suspect that information is being withheld unnecessarily, or that they are being purposely misled, their level of trust can be drastically influenced. Because of these and other aspects of trust which act in complex ways to influence public perceptions about nuclear institutions, the measurements of public trust used in this survey should be considered within the context of the complex and multidimensional structure of the concept itself.

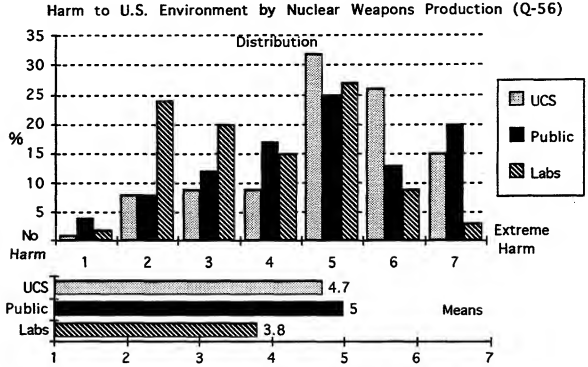
SECTION 5.2: BROAD MEASURES OF INSTITUTIONAL TRUST

Distinctly different perceptions about the relationship between institutions charged with the nuclear weapons responsibilities and the public at large were evident among the three focus groups. The focus group composed of members of the general public and the one comprised of members of the scientific community holding more nuclear-critical views both voiced concern over what might be excessive secrecy among institutions making up the U.S. nuclear weapons establishment. Some members of the focus group drawn from relatively more nuclear-supportive members of the scientific community held very different perceptions about the appropriate level of publicly shared nuclear weapons information, emphasizing the risks to national security. Some of these differences in group perspectives were highlighted in survey responses.

The Environment and Trust

Respondent perceptions of the environmental harm of nuclear weapons production were expressed on a seven point scale where one meant producing nuclear weapons has caused no harm to the U.S. environment, and seven meant such production has caused extreme harm (Q-56). Results are shown in Figure 5.1.

Figure 5.1

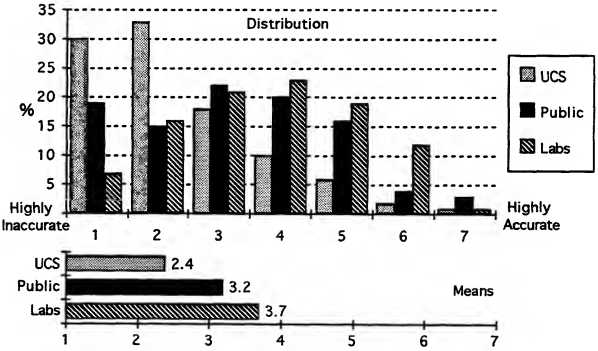


USNL respondents were divided over the environmental harm resulting from nuclear weapons production, with 46 percent considering such production to have caused little if any environmental damage, and 39 percent considering it to have caused significant to extensive harm to the environment; 15 percent were unsure. UCS and general public respondents were less equivocal, with significant majorities of both groups perceiving substantial environmental harm to have been cause by nuclear weapons production. Twenty percent of public respondents and 15 percent of UCS participants judged the environmental harm to have been extreme.

To relate trust to the above environmental perceptions, respondents were asked to assess the accuracy of official government information that has been made available to the U.S. public about the environmental effects of nuclear weapons production (Q-61). Responses were recorded on a scale from one to seven, with one meaning government information has been highly inaccurate, and seven meaning official information has been highly accurate. Response group distributions and means are compared in Figure 5.2.

Figure 5.2

Accuracy of Government Information About Environmental Effects of Nuclear Weapons Production (Q-61)



Substantial intergroup differences in perspectives about the accuracy of government information are apparent in the comparison of means, but high levels of distrust are also evident among all three groups. Respondents from the UCS were highly skeptical, with 81 percent considering government provided information to be inaccurate. Respondents from the general public also evidenced substantial doubt in government veracity, with less than one-fourth considering it to be accurate. Lab respondents were somewhat more confident of

government information, but their mean evaluation was still below mid-scale. Less than one percent of the UCS, only two percent of lab respondents, and only three percent of participants from the general public sample considered government information about the environmental effects of nuclear weapons production to be highly accurate.

These inquires indicate that about 57 percent of all respondents consider nuclear weapons production to have been harmful to the U.S. environment, and 60 percent of all respondents think that official government information that has been made available to the U.S. public about the environmental effects of nuclear weapons production has been inaccurate.

Intergroup Comparisons of Institutional Trust

To gauge levels of trust among government and nongovernment groups from which the U.S. public might receive information about nuclear weapons, each respondent was asked to indicate their level of trust in the following groups or agencies to provide reliable information about U.S. nuclear weapons: the Department of Defense; the Department of Energy; scientists employed by the government at U.S. national laboratories; scientists at universities and colleges; watchdog groups critical of nuclear weapons; the mass media; and the U.S. Congress. A scale from zero to ten was used for each, with zero indicating no trust and ten representing complete trust. Mean results are shown in Figures 5.3 through 5.9.

Figure 5.3

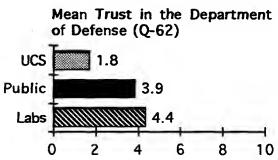


Figure 5.4

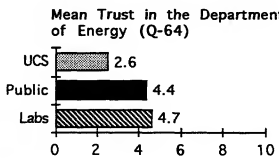


Figure 5.5

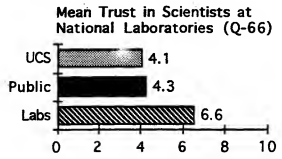


Figure 5.6

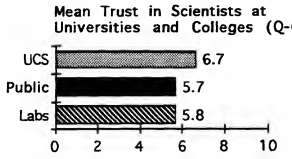


Figure 5.7

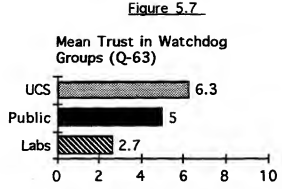


Figure 5.8

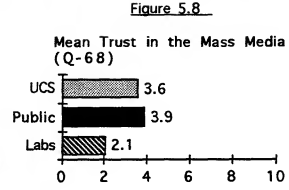
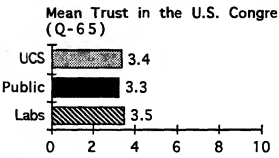


Figure 5.9



Public and lab respondents placed only moderate trust in either the Department of Defense or the Department of Energy to provide reliable information about nuclear weapons. Respondents from the UCS were highly distrustful of both. Thus the two government institutions most directly responsible for managing nuclear weapons did not enjoy high levels of trust from any of the three respondent groups.

Scientists at colleges and universities received relatively high levels of trust from UCS respondents (many of whom are themselves employed in higher education). Similarly, scientists at national laboratories evidenced relatively high levels of trust in their own

colleagues. Respondents from the general public placed slightly more trust in university scientists than in national lab scientists.

Public trust in watchdog groups critical of nuclear weapons was mid-scale, with UCS respondents placing more, and lab participants placing substantially less trust in such groups.

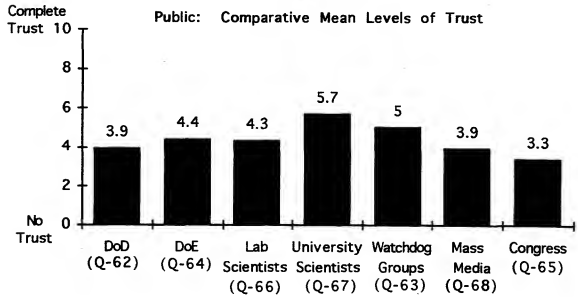
Though respondents from the public and UCS samples considered nuclear weapons information from the mass media to be only moderately trustworthy, lab respondents were disdainful of media based information, ranking the media lowest of all the institutional groups for reliable information about nuclear weapons.

Congressional information was rated as largely untrustworthy by all three groups.

Intragroup Comparisons of Trust

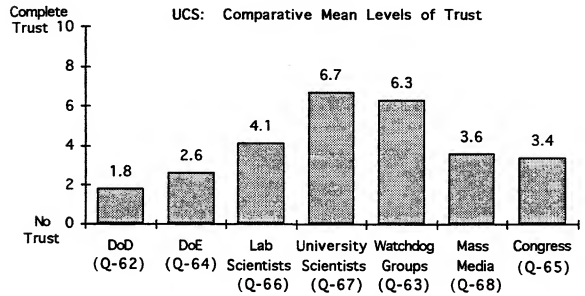
When cross sectional comparisons are made of the same seven institutions, the source judged most trustworthy by respondents from the general public was university and college scientists, followed by watchdog groups critical of nuclear weapons. Those least trustworthy in the opinions of public respondents were the Department of Defense, the media, and lowest of all, the U.S. Congress. Relative rankings among participants selected from the general public are in Figure 5.10.

Figure 5.10



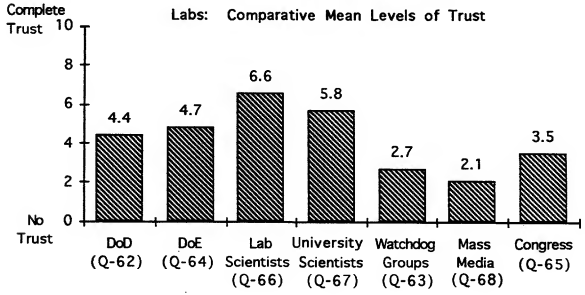
Among participants from the UCS, university scientists received the greatest levels of trust, followed by watchdog groups. The agencies least trusted were the Department of Defense and the Department of Energy. UCS comparisons are shown in Figure 5.11.

Figure 5.11



As shown in Figure 5.12, respondents from the four participating laboratories placed the greatest credibility with their peers in U.S. national labs, followed by university scientists. Watchdog groups and the media were judged least trustworthy for accurate information about nuclear weapons.

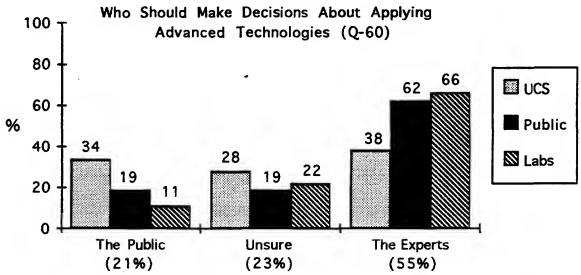
Figure 5.12



SECTION 5.3: TRUST IN EXPERTISE

We also inquired about the degree of trust respondents placed in technological expertise. Participants were asked whether they thought decisions about the applications of advanced technologies, such as genetic engineering or nuclear energy, should be made primarily by the public or mostly by technological experts in the appropriate fields (Q-60). A seven point scale was used, with one meaning the public should make most decisions about applying technology and seven meaning the experts should make such decisions. Aggregated results are shown in Figure 5.13.

Figure 5.13



Results indicated a strong willingness among respondents from the general public and the national laboratory groups to entrust decisions about social applications of advanced technologies to those with expertise in related fields. Respondents from the UCS were decidedly more reluctant to place their trust in the experts, with about one-third preferring such decisions to be made by the public, slightly less than one-third being unsure, and just over one-third willing to trust the experts. This is especially interesting in that most members of the UCS group possessed technical expertise in one or more fields of science, and many could themselves be considered to be among the experts.

SECTION 5.4: RELATING TRUST TO PERCEPTIONS OF NUCLEAR WEAPONS RISKS

To investigate the relationship between trust and perceptions of risks associated with nuclear weapons, two indices were created from among the trust questions previously discussed. An index of what can be characterized as a "nuclear establishment" group was created by combining and averaging responses to Question 62, which asked for the level of trust respondents placed in the Department of Defense to provide reliable information about U.S. nuclear weapons, Question 64, which asked the same of the Department of Energy, and Question 66, which asked for trust in scientists employed by the government at the U.S. national laboratories. That new variable, titled "Nuclear Establishment," was represented on a scale where zero meant no trust and ten meant complete trust.

To measure trust placed in sources of information about nuclear weapons which are not part of the nuclear establishment, a second index of "nonestablishment sources" was created by combining and averaging responses to Question 63, which asked for the level of trust respondents placed in watchdog groups critical of U.S. nuclear weapons, and Question 68, which asked the same of the mass media. That new variable, titled "Nonestablishment," was represented on the same ten point scale.

The two created variables were then used as independent variables in ordinary least squares multiple regression analysis to explain the nuclear weapons management risk index described in Chapter 3 and shown in Figures 3.9 and 3.10 (consisting of combined average responses to questions 4, 5, 6, 7, 8, 9, 20, and 21). Statistical results are shown in Table 5.1.

Table 5.1: Nuclear Establishment Index and Nonestablishment Index vs. Nuclear Weapons Management Risk Index

	INDEPEND. VARIABLES	COEFF.	STD. ERROR	STD. COEFF.	t VALUE	P VALUE	ADJUST. R^2
PUBLIC	Intercept	6.30	.150	6.30	43.2	<.0001	.056
	Nuc. Establish. Index	-.19	.024	-.22	-7.7	<.0001	
	Nonestablish. Index	.15	.026	.17	6.0	<.0001	
UCS	Intercept	6.50	.190	6.50	33.9	<.0001	.210
	Nuc. Establish. Index	-.51	.030	-.44	-16.7	<.0001	
	Nonestablish. Index	.15	.032	.12	4.3	<.0001	
LABS	Intercept	3.90	.140	3.90	26.7	<.0001	.240
	Nuc. Establish. Index	-.31	.022	-.35	-14.1	<.0001	
	Nonestablish. Index	.31	.026	.30	12.1	<.0001	

Results indicate that respondent trust placed in either the nuclear establishment index or the nonestablishment index was statistically related at highly significant levels to respondent perceptions of risks associated with nuclear weapons, as expressed by the nuclear weapons management risk index. The direction of effect produced by each of the two independent variables was consistent across all three respondent groups. The explanatory power of the independent variables was modest among the general public response group ($AdjR^2 = 0.056$) and strong among both the UCS ($AdjR^2 = 0.21$) and lab ($AdjR^2 = 0.24$) response groups.

Within the general public group, as trust in the DoD, DoE, and scientists at national laboratories (represented by the nuclear establishment index) increased by one point on a ten point scale, respondent perception of risks associated with managing nuclear weapons (represented by the nuclear weapons management risk index) decreased by 0.19 points on a ten point scale. As public trust in watchdog groups and the mass media (represented by the

nonestablishment index) increased by one point, perception of risk increased by 0.15 points.

The relationships were stronger among respondents from the UCS, where a one point increase in the nuclear establishment index resulted in a decrease in risk perception of 0.51 points. Similarly, a one point increase in trust placed in the nonestablishment index resulted in an increased perception of risk by 0.15 points among the UCS group.

Among respondents from the participating national laboratories, a one point increase in the nuclear establishment index resulted in a decreased risk perception of 0.31 points, and for every one point increase in trust in the nonestablishment index, USNL perceptions of risk increased by 0.31 points.

These results support the hypothesis that as trust in public institutions to provide reliable information about nuclear weapons increases, perceptions of risk change in the direction of the trusted information source. If the source was nuclear-supportive, risk perceptions were lowered; if the source was nuclear-critical, risk perceptions were raised. Thus for these specific questions, trust and risk were clearly related in predictable ways.

SECTION 5.5: RELATING TRUST TO PERCEPTIONS OF NUCLEAR WEAPONS UTILITIES

To investigate the relationship between public trust and perceptions of utility associated with nuclear weapons, the nuclear establishment and nonestablishment indices created above were used in multiple regression analyses to explain perceptions of nuclear utility as expressed by the nuclear utility index described in Chapter 4, and shown in Figures 4.2 and 4.3. (consisting of combined average responses to questions 49, 50, 51, and 70). Statistical results are summarized in Table 5.2.

Table 5.2: Nuclear Establishment Index and Nonestablishment Index vs. Nuclear Weapons Utility Index

	INDEPEND. VARIABLES	COEFF.	STD. ERROR	STD. COEFF.	t VALUE	P VALUE	ADJUST. R^2
PUBLIC	Intercept	5.80	.150	5.80	37.3	<.0001	.059
	Nuc. Establish. Index	.23	.026	.25	9.1	<.0001	
	Nonestablish. Index	-.05	.027	-.048	-1.7	.0817	
UCS	Intercept	3.80	.240	3.80	15.7	<.0001	.140
	Nuc. Establish. Index	.51	.038	.36	13.2	<.0001	
	Nonestablish. Index	-.14	.040	-.094	-3.4	.0006	
LABS	Intercept	5.50	.180	5.50	31.1	<.0001	.190
	Nuc. Establish. Index	.39	.027	.38	14.5	<.0001	
	Nonestablish. Index	-.24	.032	-.19	-7.5	<.0001	

Results indicate that, with one exception, respondent trust placed in either the nuclear establishment index or the nonestablishment index was statistically related at highly significant levels to respondent perceptions of utilities associated with nuclear weapons for achieving U.S. national interests, as expressed by the nuclear weapons utility index. As with nuclear risk, discussed above, the direction of effect produced by each of the two independent variables was consistent across all three respondent groups. Again, the explanatory power of the independent variables was modest among the general public response group (AdjR^2 = 0.059) and substantial among both the UCS (AdjR^2 = 0.14) and USNL (AdjR^2 = 0.19) response groups.

Among respondents from the general public, as trust in the nuclear establishment index increased by one point on a ten point scale, perceptions of benefits or utilities associated with having a nuclear arsenal (represented by the nuclear weapons utility index) increased by 0.23 points on a ten point scale. As trust in the nonestablishment index in-

creased by one point, perception of nuclear weapons utility decreased by 0.05 points, but the relationship was not quite statistically significant at the 95 percent confidence level.

Among participating members of the UCS, a one point increase in the nuclear establishment index resulted in an increase in perceived nuclear weapons utility of 0.51 points, and for every one point increase in the nonestablishment index, UCS perceptions of nuclear utility decreased by 0.14 points.

Results were also consistent among the national lab participants where perceptions of nuclear utility increased 0.39 points for each one point increase in trust in the nuclear establishment index, and decreased 0.24 points for each one point increase in trust in the nonestablishment index.

Thus, as was the case with perceptions of nuclear risks, respondent perceptions of the utility of nuclear weapons for achieving U.S. national interests (represented by the nuclear utility index) varied predictably with level of trust represented by both the nuclear establishment and nonestablishment indices. These results support a link between trust and perceptions of nuclear utility which parallels that shown earlier between trust and perceptions of nuclear risks. Both findings indicate an important relationship between public trust in information about nuclear weapons and their evaluations of the risks and utilities associated with such weapons.

CHAPTER 6:

POLICY AND SPENDING IMPLICATIONS

SECTION 6.1: RESEARCH ISSUES

How should U.S. nuclear weapons research be directed in the aftermath of the arms races of the Cold War? Two questions specifically inquired about weapons research at the nation's primary nuclear weapons laboratories -- Sandia, Los Alamos, and Lawrence Livermore. Participants were asked to respond to the following statement: *The U.S. national laboratories should pursue new technologies that might be used to make existing nuclear weapons more safe* (Q-10). Participants were also asked to respond to a different research priority: *The U.S. national laboratories should pursue new technologies that might lead to new types of nuclear weapons* (Q-11). A scale from one to seven was used for responding to each statement, with one meaning the participant disagreed strongly and seven meaning they agreed strongly. Results are compared in Figures 6.1 and 6.2 below.

Figure 6.1

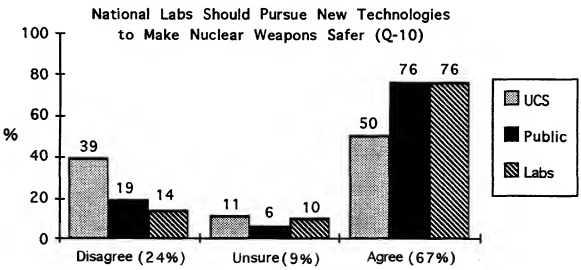
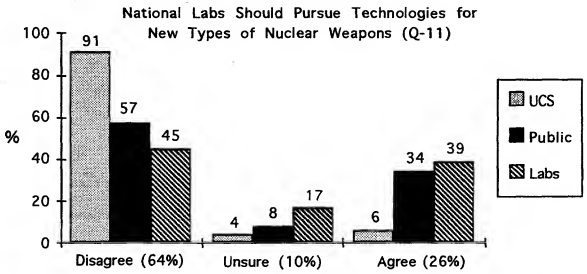


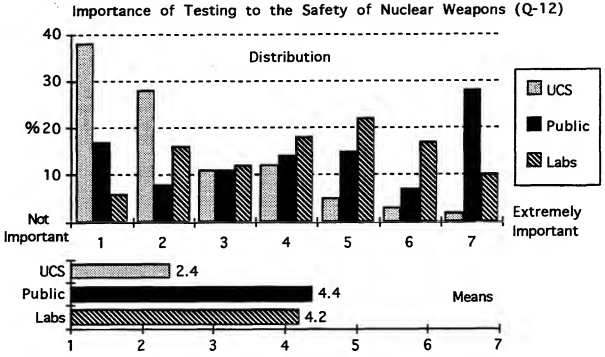
Figure 6.2



Research into new technologies which might increase the safety of nuclear weapons was strongly supported by all three groups, with 68 percent of all respondents supporting such efforts at the three national laboratories most identified with nuclear weapons research. However, there was strong opposition to national laboratory research into new technologies which might lead to new types of nuclear weapons, with a majority of respondents from the general public and the UCS and nearly half of the participants from the national laboratories opposing such research. Slightly more than one-third of respondents from the general public and the national labs agreed that new technologies for new types of nuclear weapons should be pursued.

Underground nuclear testing has become an aspect of nuclear weapons research which generates considerable debate. Some experts argue that underground nuclear testing is important to insure the safety of nuclear weapons and the integrity of the existing nuclear stockpile. Other experts argue that nuclear safety can be assured through other means such as simulation. Respondents were asked to rate the importance of underground nuclear testing to the safety of U.S. nuclear weapons on a scale from one to seven, where one meant testing is not important to nuclear safety, and seven meant testing is extremely important to nuclear safety (Q-12). Distributions and comparison of means are displayed in Figure 6.3.

Figure 6.3



Respondents from the public and from the national laboratories perceived underground nuclear testing to be of much greater importance to the safety of nuclear weapons than did respondents from the UCS. Nearly one-third of participants from the general public considered testing to be extremely important, and overall, 50 percent of public respondents and 48 percent of lab respondents rated the importance of nuclear testing above mid-scale. In contrast, nearly 40 percent of UCS respondents considered testing not to be important, and more than three out of four rated testing below mid-scale.

SECTION 6.2: SPENDING PRIORITIES

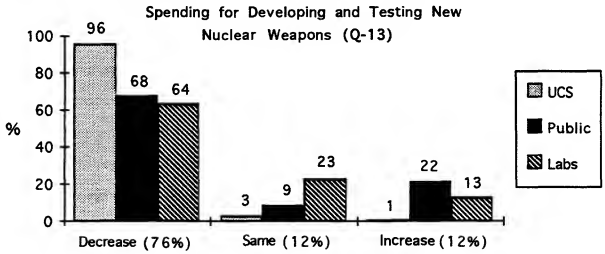
To better understand how the three participating groups perceived nuclear weapons funding options, a series of questions were asked about how respondents thought spending should change for seven nuclear weapons related issues. A scale from one to seven was used,

where one meant spending should substantially decrease and seven meant spending should substantially increase. Results are grouped in the following two discussions.

Preference for Decreasing Spending

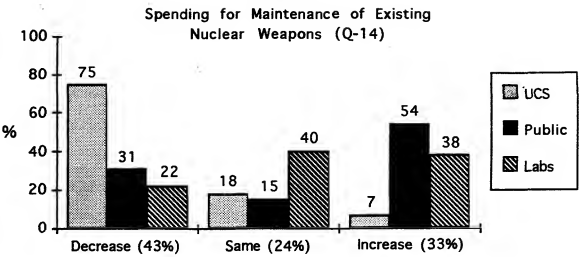
Respondents preferred spending to decrease or remain about the same in three of the seven areas. As shown in Figure 6.4, there was little support among any of the three groups for increasing spending for developing and testing new nuclear weapons. Three out of four total respondents favored decreasing spending in this category, with fully 96% of UCS respondents and about two-thirds of respondents from the general public and the national labs preferring to decrease research and development funding for new nuclear weapons.

Figure 6.4



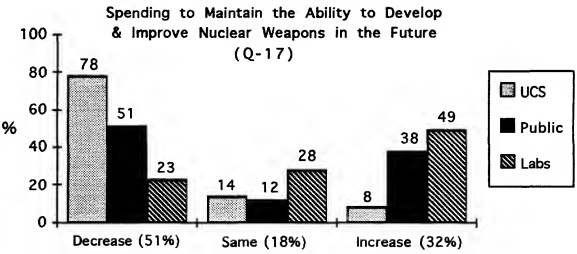
Preferences were more divided about how spending should change for maintenance of existing nuclear weapons, with slightly more than half the respondents from the general public favoring increased funding, but only about one-third of the lab respondents and a mere seven percent of UCS respondents favoring increased funding. Three out of four UCS participants, about one-third of public respondents, and about one-fourth of lab participants favored decreasing funding for nuclear weapons maintenance. About one-fourth of all respondents preferred maintenance funding to remain at current levels. Results are shown in Figure 6.5.

Figure 6.5



Respondents were split over how funding should change for maintaining the infrastructure and technical support necessary for developing and improving nuclear weapons in the future. UCS and general public respondents favored decreasing spending in this category, while lab respondents favored increasing or maintaining current funding levels. Figure 6.6 shows how the groups were divided.

Figure 6.6

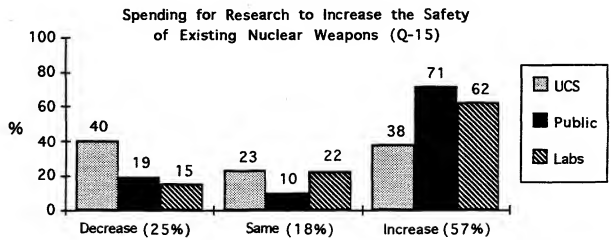


Preferences for Increasing Spending

Respondents favored increasing spending in four issue areas. As shown in Figure 6.7, spending increases were favored by substantial majorities of the public and lab respondents

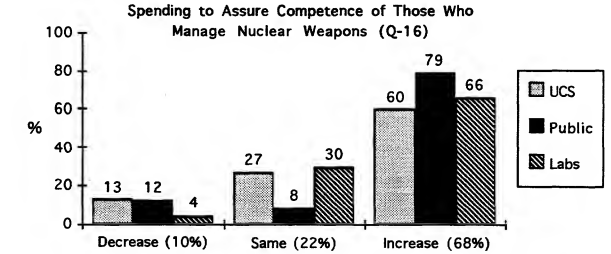
and more than one-third of UCS respondents for research to increase the safety of existing nuclear weapons.

Figure 6.7



Support for increasing spending to insure the competence of those who manage nuclear weapons was even stronger, with 60 or more percent of each of the three groups stating a preference for increased funding. The training category is shown in Figure 6.8.

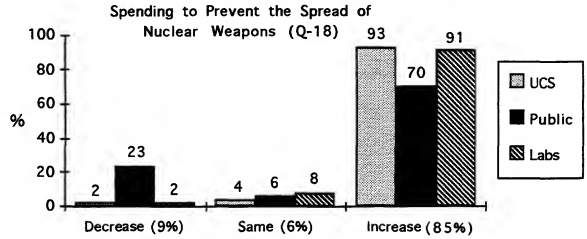
Figure 6.8



Since both questions 15 and 16 dealt with safety, it seems clear that there is substantial support across the three response groups for technological and training issues contributing to nuclear surety.

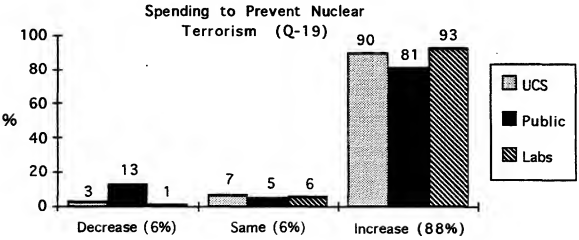
Even higher levels of support were shown for the final two funding categories - preventing nuclear proliferation and nuclear terrorism. Figure 6.9 shows that 93 percent of UCS respondents, 70 percent of respondents from the general public, and 91 percent of national lab participants favored increasing spending to prevent nuclear proliferation.

Figure 6.9



The highest levels of concurrence among all three response groups was found in the nearly unanimous support for increasing funding to prevent nuclear terrorism. As shown in Figure 6.10, fully 88 percent of all participants favored increasing funding in this category, and these preferences are consonant with risk perceptions of the current and future threat of nuclear terrorism as discussed in Chapter 2, and shown in Figures 2.5 and 2.6.

Figure 6.10

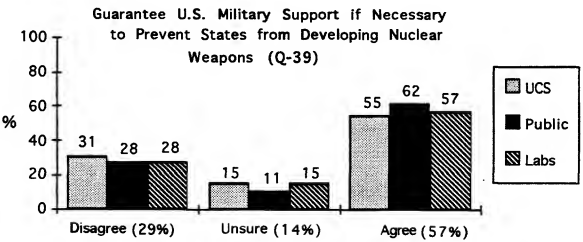


Respondent sensitivity to nuclear proliferation and nuclear terrorism was consistent across the three focus groups, across all three survey samples, and between focus group participants and survey participants, regardless of group identity.

SECTION 6.3: POLICY IMPLICATIONS OF NUCLEAR PROLIFERATION

In addition to measuring sensitivity to perceived risks of nuclear proliferation, two questions probed respondent preferences regarding policies designed to prevent or contain the further spread of nuclear weapons. Respondents were asked to indicate agreement or disagreement on a seven point scale where one indicated they disagreed strongly and seven indicated they agreed strongly with the following statement: *The U.S. should consider providing guarantees of military support to other countries if necessary to prevent them from developing nuclear weapons of their own* (Q-39). Results are summarized in Figure 6.11.

Figure 6.11

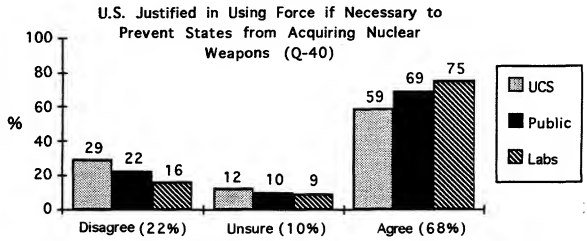


A majority of each of the three groups agreed that the U.S. should consider providing military guarantees if necessary to prevent other countries from developing nuclear weapons of their own.

To carry the policy options a step further, we asked the participants to respond to the following: *In some cases, the U.S. would be justified in using force to prevent other countries*

from acquiring nuclear weapons (Q-40). The same seven point scale from strongly disagree to strongly agree was used, and responses indicated even stronger intergroup support and agreement, with 68 percent of all respondents concurring. Three out of four lab respondents, two out of three general public respondents, and almost two of every three UCS respondents agreed that the U.S. would in some circumstances be justified in using force to prevent some states from acquiring nuclear weapons capabilities. Results are summarized in Figure 6.12.

Figure 6.12



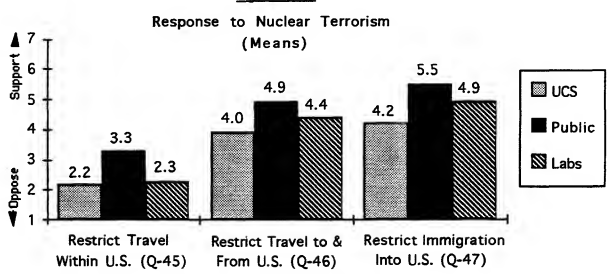
Again, consistency across questions designed to measure perceived risk, spending priorities, and forceful policy options indicates deep and consistent concern among all three groups about the implications of further nuclear proliferation.

SECTION 6.4: POLICY IMPLICATIONS OF NUCLEAR TERRORISM

The immediate consequences of an act of terrorism in which nuclear weapons or nuclear materials are used could obviously be catastrophic. What may be less easily visualized are the long-term implications of such acts for basic freedoms enjoyed by open societies. Three questions were asked to better understand how nuclear terrorism might influence policies pertaining to travel and immigration. A hypothetical situation in which a nuclear weapon was detonated by terrorists somewhere in Europe was used to inquire about how respondents would

react. Question 45 asked whether in the aftermath of such an act respondents would support restricting travel *within* the U.S. Question 46 asked whether or not respondents would support restricting travel *to* and *from* the U.S. And question 47 asked if respondents would favor restricting immigration *into* the U.S. A scale from one to seven was used for all three questions, with one indicating the respondent would strongly oppose the action, and seven indicating the respondent would strongly support the action. Mean responses are compared in Figure 6.13.

Figure 6.13

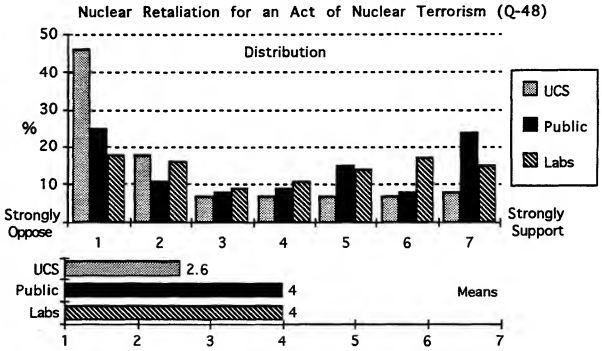


Three points can be made about these preferences for response to a hypothetical act of nuclear terrorism in Europe. First, as the possible response choices moved away from directly influencing respondent freedom of action, support increased. The course of action which would probably most directly affect respondents (restricting travel within the U.S.) was not, on average, supported by any of the three groups. However, all three groups were more supportive of restricting travel to and from the U.S., and all three were even more supportive of restricting immigration into the U.S. A tendency for respondents to more willingly restrict the range of action of others seems apparent. Second, the substantial support for restricting immigration into the U.S. as a result of a single hypothetical act of nuclear terrorism in Europe implies that an actual act of nuclear terrorism, especially within the U.S., might create substantial public pressure toward withdrawal and isolation within U.S. borders. This would have

obvious implications for international travel, trade, and commerce in what is becoming an increasingly interdependent international economy. Finally, respondents from the general public were more willing to support such restrictions on an open society than were either of the generally more highly educated groups of scientists.

Respondents were asked how they would feel about the U.S. using nuclear weapons to attack a country that has supported nuclear terrorism against the U.S. (Q-48). A scale from one to seven was used where one meant the respondent would strongly oppose a nuclear response, and seven meant the respondent would strongly support a nuclear response. Results are portrayed below in Figure 6.14.

Figure 6.14



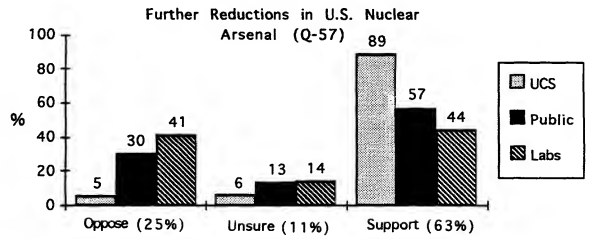
On average, respondents from the general public and the national laboratories neither strongly opposed nor supported nuclear retaliation for an act of nuclear terrorism against the U.S. However, both groups exhibited a bimodal distribution, with 44% of the general public respondents and 43% of respondents from the national laboratories opposing, and 47% of the public and 44% of the lab respondents favoring nuclear retaliation. Respondents from the

Union of Concerned Scientists were grouped much more clearly in opposition to nuclear retaliation.

SECTION 6.5: POLICY IMPLICATIONS FOR U.S. NUCLEAR FORCE LEVELS

Recalling the perspectives of nuclear weapons as a persistent attribute of the current and foreseeable international system, as shown in Chapter 2, Figures 2.9 and 2.10, and given the levels of concern evidenced by all three groups regarding nuclear proliferation and nuclear terrorism, how do Americans feel about reducing the U.S. nuclear arsenal? Question 57 noted that the U.S. has agreed to reduce the number of its nuclear weapons by about 30 to 40 percent, and asked each respondent group whether they thought the post-Cold War environment warranted further reductions, or whether international ethnic conflicts, revolutions, and other uncertainties make it too risky to reduce below currently negotiated levels. Participants were asked to indicate how they felt about further reducing U.S. nuclear weapons using a scale from one to seven, where one meant they strongly opposed further reductions in U.S. nuclear weapons, and seven meant they strongly supported further reductions. Results are summarized in Figure 6.15.

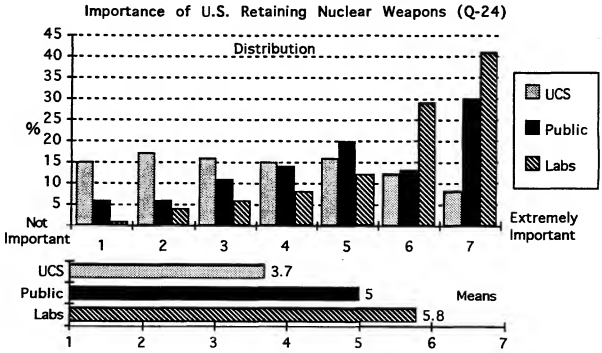
Figure 6.15



A very large majority of UCS respondents, over half of the respondents from the general public, and nearly half of the respondents from the national laboratories supported further reducing the number of nuclear weapons below the levels of current agreements. Note that because the question used existing arms control agreements as the baseline, results imply levels of support for future reductions within the context of future arms control agreements and should not be interpreted as support for unilateral U.S. reductions.

In a related inquiry, respondents were asked how important they thought it is for the U.S. to continue to retain nuclear weapons, given the breakup of the Soviet Union and the end of the Cold War (Q-24). A scale from one to seven was used, with one indicating that retaining U.S. nuclear weapons was not important, and seven indicating it was extremely important. Distributions and mean results are compared in Figure 6.16.

Figure 6.16

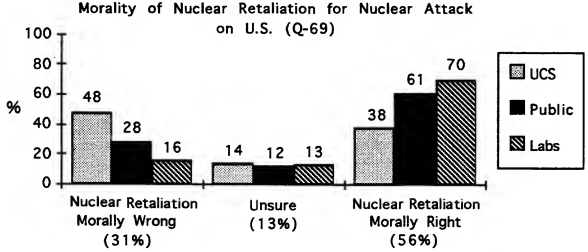


Here distinct differences are apparent in the perceptions of the UCS respondents as compared to general public and national lab respondents. Participants from the UCS seemed to lack consensus, with answers spread more or less evenly across the scale. Participants

from the national labs and the general public were less equivocal, with 82 percent of lab respondents and 63 percent of public respondents rating the importance of retaining nuclear weapons above mid-scale. The means reflect the different group perspectives, with the UCS being just below mid-scale, and the other two groups averaging well above mid-scale.

Finally, participants were asked to respond to a question about the morality of nuclear weapons. Using a scale from one to seven, where one meant it would be morally wrong, and seven meant it would be morally right, each respondent was asked to evaluate the morality of the U.S. using nuclear weapons to retaliate against another country which had attacked the U.S. with nuclear weapons. Results are shown in Figure 6.17.

Figure 6.17



Strong majorities of both the public and national lab respondents agreed that if the U.S. was the subject of a nuclear attack by another country, it would be morally justified in retaliating with nuclear weapons. Only 38 percent of UCS respondents concurred, with nearly one-half of UCS participants feeling nuclear retaliation by the U.S. would not be morally justified.

In conclusion, while respondents were generally receptive to the potential for nuclear arms to be reduced through future arms control negotiations, most were unwilling for the U.S. to forego its nuclear arsenal, and though feelings were mixed, two of the three re-

spondent groups agreed the U.S. would be morally justified in using its nuclear arsenal to retaliate against a nuclear attack by another country.

Appendix 1

Survey Questions, Distributions, and Means

Section One

This first set of questions concerns ***your*** views of the risks to society associated with a series of broad social issues. On a scale of 0 to 10, where 0 means **NO RISK**, and 10 means **EXTREME RISK**, where would you place each of the following issues? Please check the appropriate box.

1. The use of pesticides in food production?

	NO RISK 0	1	2	3	4	5	6	7	8	9	EXTREME RISK 10	Mean
Pub %	1	2	3	6	7	18	8	11	18	7	20	6.7
UCS %	0	3	8	15	7	12	11	15	15	5	9	5.8
Labs %	1	8	16	18	10	13	9	11	7	3	2	4.4

2. The operation of nuclear power plants?

	NO RISK 0	1	2	3	4	5	6	7	8	9	EXTREME RISK 10	Mean
Pub %	4	3	6	9	8	18	8	10	15	5	15	5.9
UCS %	0	4	9	10	7	9	9	12	16	9	14	6.2
Labs %	3	26	23	18	7	9	6	4	2	1	0	2.9

3. The contamination of the U.S. blood supply?

	NO RISK 0	1	2	3	4	5	6	7	8	9	EXTREME RISK 10	Mean
Pub %	2	2	5	7	6	13	6	10	14	7	28	6.8
UCS %	1	11	17	15	9	12	10	10	6	4	5	4.5
Labs %	1	8	13	15	11	12	10	12	10	4	4	4.9

4. The testing of nuclear weapons?

	NO RISK 0	1	2	3	4	5	6	7	8	9	EXTREME RISK 10	Mean
Pub %	3	1	3	4	6	14	7	10	14	8	29	7.0
UCS %	1	3	5	6	5	8	7	11	14	14	25	7.1
Labs %	5	22	20	14	7	10	6	6	5	2	3	3.4

The next series of questions inquires about your perceptions of the risks to society involved with the management of nuclear weapons in the U.S. On the same type of a scale from 0 to 10, where 0 means **NO RISK**, and 10 means **EXTREME RISK**, please rate the risks you think are associated with each of the following activities in the U.S.

5. Manufacturing nuclear weapons?

	NO RISK 0	1	2	3	4	5	6	7	8	9	EXTREME RISK 10	Mean
Pub %	3	3	6	6	6	14	8	11	13	8	22	6.5
UCS %	0	2	5	8	5	7	8	13	15	13	24	7.1
Labs %	2	20	21	18	10	10	6	6	3	2	2	3.4

6. Transporting nuclear weapons?

	NO RISK 0	1	2	3	4	5	6	7	8	9	EXTREME RISK 10	Mean
Pub %	2	2	5	5	6	13	8	13	15	7	25	6.8
UCS %	0	3	6	9	6	11	10	12	13	12	18	6.6
Labs %	3	21	22	17	9	8	6	7	3	1	2	3.3

7. Storing existing nuclear weapons?

	NO RISK 0	1	2	3	4	5	6	7	8	9	EXTREME RISK 10	Mean
Pub %	2	2	5	7	7	13	9	11	13	7	23	6.6
UCS %	1	3	8	8	7	10	10	12	16	8	16	6.3
Labs %	5	27	21	16	8	8	5	5	2	1	1	3.0

8. Disassembling nuclear weapons?

	NO RISK 0	1	2	3	4	5	6	7	8	9	EXTREME RISK 10	Mean
Pub %	4	3	7	8	8	17	7	10	14	6	17	6.0
UCS %	1	5	13	14	9	12	10	9	14	5	7	5.2
Labs %	2	17	23	20	13	9	6	5	3	1	0	3.3

9. Storing the radioactive materials from disassembled weapons?

	NO RISK 0	1	2	3	4	5	6	7	8	9	EXTREME RISK 10	Mean
Pub %	2	1	2	3	4	9	7	10	18	11	34	7.6
UCS %	0	3	6	7	5	10	10	10	17	13	21	6.9
Labs %	3	16	18	16	12	11	7	7	5	2	2	3.8

The next two questions pertain to nuclear weapons research at the three U.S. national weapons laboratories (Sandia, Los Alamos, and Lawrence Livermore). Please respond to each statement using a scale from 1 to 7, where 1 means you **DISAGREE STRONGLY**, and 7 means you **AGREE STRONGLY**.

10. The U.S. national laboratories should pursue new technologies that might be used to make existing nuclear weapons more safe.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
Pub %	12	3	4	6	12	12	52	5.5
UCS %	19	12	8	11	14	16	20	4.2
Labs %	3	5	6	10	17	28	31	5.5

11. The U.S. national laboratories should pursue new technologies that might lead to new types of nuclear weapons.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
Pub %	36	12	9	8	11	6	17	3.3
UCS %	64	20	7	4	3	1	2	1.7
Labs %	13	19	13	17	17	13	9	3.8

12. Some experts argue that underground nuclear testing is important to insure the safety of nuclear weapons. Other experts argue that nuclear safety can be assured through other means. On a scale from 1 to 7, where 1 is **NOT IMPORTANT**, and 7 is **EXTREMELY IMPORTANT**, how would you rate the importance of underground nuclear testing to the safety of U.S. nuclear weapons?

	NOT IMPORTANT 1	2	3	4	5	6	EXTREMELY IMPORTANT 7	Mean
Pub %	17	8	11	14	15	7	28	4.4
UCS %	38	28	11	12	5	3	2	2.4
Labs %	6	16	12	18	22	17	10	4.2

The U.S. is currently evaluating national security requirements and priorities. On a scale from 1 to 7, where 1 means spending should **SUBSTANTIALLY DECREASE**, and 7 means spending should **SUBSTANTIALLY INCREASE**, please indicate how you think government spending on nuclear weapons issues should change in each of the following areas:

13. Developing and testing new nuclear weapons?

	SUBSTANTIALLY DECREASE 1	2	3	4	5	6	SUBSTANTIALLY INCREASE 7	Mean
Pub %	40	16	12	9	11	3	8	2.8
UCS %	74	17	5	3	1	0	0	1.4
Labs %	16	25	23	23	9	3	1	3.0

14. Maintenance of existing nuclear weapons?

	SUBSTANTIALLY DECREASE 1	2	3	4	5	6	SUBSTANTIALLY INCREASE 7	Mean
Pub %	12	6	13	15	19	10	25	4.5
UCS %	28	26	21	18	5	1	1	2.6
Labs %	3	6	13	40	24	11	3	4.2

15. Research to increase the safety of existing nuclear weapons?

	SUBSTANTIALLY DECREASE 1	2	3	4	5	6	SUBSTANTIALLY INCREASE 7	Mean
Pub %	8	3	8	10	17	14	40	5.2
UCS %	14	12	14	23	16	12	10	3.9
Labs %	2	4	9	22	31	22	9	4.8

16. Training to assure competence of those who manage U.S. nuclear weapons?

	SUBSTANTIALLY DECREASE 1	2	3	4	5	6	SUBSTANTIALLY INCREASE 7	Mean
Pub %	6	2	4	8	14	13	52	5.7
UCS %	3	3	7	27	20	19	21	5.0
Labs %	0	1	3	30	31	24	11	5.1

17. Maintaining the ability to develop and improve U.S. nuclear weapons in the future?

	SUBSTANTIALLY DECREASE 1	2	3	4	5	6	SUBSTANTIALLY INCREASE 7	Mean
Pub %	23	12	16	12	14	8	16	3.7
UCS %	41	23	14	14	6	1	1	2.3
Labs %	5	7	11	28	25	17	7	4.4

18. Preventing the spread of nuclear weapons?

	SUBSTANTIALLY DECREASE 1	2	3	4	5	6	SUBSTANTIALLY INCREASE 7	Mean
Pub %	14	4	5	6	12	12	46	5.2
UCS %	1	0	1	4	6	22	65	6.4
Labs %	0	1	1	8	19	36	36	5.9

19. Preventing nuclear terrorism?

	SUBSTANTIALLY DECREASE 1	2	3	4	5	6	SUBSTANTIALLY INCREASE 7	Mean
Pub %	7	2	4	5	8	12	61	5.8
UCS %	1	1	1	7	11	22	57	6.2
Labs %	0	0	1	6	17	31	45	6.1

20. Some people worry that a nuclear weapon might someday be used by U.S. forces without the president's authorization. This time, on a scale from 0 to 10, where 0 means **NOT AT ALL LIKELY**, and 10 means **HIGHLY LIKELY**, how would you rate the likelihood of a **U.S.** nuclear weapon being used within the next 25 years without presidential authorization?

	NOT AT ALL LIKELY 0	1	2	3	4	5	6	7	8	9	HIGHLY LIKELY 10	Mean
Pub %	15	13	11	12	6	14	4	6	8	2	10	4.1
UCS %	7	21	17	15	5	10	6	5	6	2	4	3.6
Labs %	20	38	19	9	3	3	1	3	2	1	1	1.9

21. Some people are concerned about the possibility of an accidental explosion of a nuclear weapon. On the same scale from 0 to 10, how would you rate the likelihood of an accident involving a **U.S.** nuclear weapon causing an unintended nuclear explosion?

	NOT AT ALL LIKELY 0	1	2	3	4	5	6	7	8	9	HIGHLY LIKELY 10	Mean
Pub %	5	10	12	11	8	18	8	9	7	3	10	4.8
UCS %	4	14	17	16	6	9	8	7	7	4	6	4.2
Labs %	24	37	18	9	3	4	2	2	1	1	0	1.7

22. Turning now to more general issues of security from international threats, how do you think the breakup of the Soviet Union has affected the likelihood that the U.S. will be involved in a war with any country in which nuclear weapons are used? On a scale from 1 to 7, where 1 means the chances have **DECREASED GREATLY**, and 7 means the chances have

INCREASED GREATLY, how has the breakup of the Soviet Union affected the chances that the **U.S.** will be involved in a war with **ANY** country in which nuclear weapons are used?

	DECREASED GREATLY 1	2	3	4	5	6	INCREASED GREATLY 7	Mean
Pub %	11	6	18	15	19	10	11	3.9
UCS %	10	23	21	19	16	8	3	3.4
Labs %	3	13	15	19	30	16	4	4.2

23. Using the same scale, where 1 means the chances have **DECREASED GREATLY**, and 7 means the chances have **INCREASED GREATLY**, how do you think the breakup of the Soviet Union has affected the possibility that nuclear weapons will be used by **ANY** country against **ANY** other country?

	DECREASED GREATLY 1	2	3	4	5	6	INCREASED GREATLY 7	Mean
Pub %	6	8	14	18	22	14	18	4.5
UCS %	3	7	13	21	27	21	8	4.6
Labs %	1	3	7	17	31	30	12	5.1

24. Given the breakup of the Soviet Union, how important do you think it is for the U.S. to continue to retain nuclear weapons? On a scale of 1 to 7, where 1 is **NOT IMPORTANT**, and 7 is **EXTREMELY IMPORTANT**, how would you rate the importance of the U.S. retaining nuclear weapons today?

	NOT IMPORTANT 1	2	3	4	5	6	EXTREMELY IMPORTANT 7	Mean
Pub %	6	6	11	14	20	13	30	5.0
UCS %	15	17	16	15	16	12	8	3.7
Labs %	1	4	6	8	12	29	41	5.8

25. Next we want to know how important you think several issues are in relation to each other. Please review the following five broad concerns in terms of relative importance today, and rank each from 1, **MOST IMPORTANT**, to 5, **LEAST IMPORTANT**, by placing the appropriate number in each box. Please do not assign the same number to any two issues.

25a. Global warming?

	MOST IMPORTANT 1	2	3	4	LEAST IMPORTANT 5	Mean
Public %	8	23	37	7	25	3.2
UCS %	23	19	20	17	21	2.9
Labs %	8	9	11	19	54	4.0

25b. Illegal drug trafficking?

	MOST IMPORTANT 1	2	3	4	LEAST IMPORTANT 5	Mean
Public %	11	20	27	14	28	3.3
UCS %	5	11	14	20	50	4.0
Labs %	22	23	18	18	18	2.9

25c. The AIDS epidemic?

	MOST IMPORTANT 1	2	3	4	LEAST IMPORTANT 5	Mean
Public %	13	20	18	23	26	3.3
UCS %	11	19	26	32	12	3.2
Labs %	19	24	25	22	10	2.8

25d. The spread of nuclear weapons?

	MOST IMPORTANT 1	2	3	4	LEAST IMPORTANT 5	Mean
Public %	21	19	13	34	13	3.0
UCS %	25	27	23	18	8	2.6
Labs %	24	26	24	19	8	2.6

25e. World hunger?

	MOST IMPORTANT 1	2	3	4	LEAST IMPORTANT 5	Mean
Public %	47	18	7	22	7	2.3
UCS %	36	25	18	13	9	2.3
Labs %	27	18	22	22	11	2.7

Our next subject deals with the spread of nuclear weapons to other countries. Using a scale from **DEFINITELY NO** to **DEFINITELY YES** please indicate your judgment of whether or not each of the following countries currently possesses nuclear weapons by marking the appropriate response.

26. Canada? (printed survey)

	DEF. NO 1	PROB. NO 2	DON'T KNOW 3	PROB. YES 4	DEF. YES 5	Mean
UCS %	32	30	14	16	8	2.4
Labs %	30	31	16	18	6	2.4

26a. Canada? (telephone survey)

	NO 0	YES 1
Public %	47	53

27. Germany? (printed survey)

	DEF. NO 1	PROB. NO 2	DON'T KNOW 3	PROB. YES 4	DEF. YES 5	Mean
UCS %	31	26	10	21	12	2.6
Labs %	24	28	11	25	11	2.7

27a. Germany? (telephone survey)

	NO 0	YES 1
Public %	22	78

28. India? (printed survey)

	DEF. NO 1	PROB. NO 2	DON'T KNOW 3	PROB. YES 4	DEF. YES 5	Mean
UCS %	1	6	9	37	47	4.2
Labs %	1	7	8	37	47	4.2

28a. India? (telephone survey)

	NO 0	YES 1
Public %	49	51

29. Kazakhstan? (printed survey)

	DEF. NO 1	PROB. NO 2	DON'T KNOW 3	PROB. YES 4	DEF. YES 5	Mean
UCS %	3	8	34	30	26	3.7
Labs %	2	6	38	27	27	3.7

29a. Kazakhstan? (telephone survey)

	NO 0	YES 1
Public %	43	57

30. Japan? (printed survey)

	DEF. NO 1	PROB. NO 2	DON'T KNOW 3	PROB. YES 4	DEF. YES 5	Mean
UCS %	43	30	10	12	6	2.1
Labs %	30	35	13	17	5	2.3

30a. Japan? (telephone survey)

	NO 0	YES 1
Public %	34	66

31. China? (printed survey)

	DEF. NO 1	PROB. NO 2	DON'T KNOW 3	PROB. YES 4	DEF. YES 5	Mean
UCS %	0	2	3	24	70	4.6
Labs %	0	1	2	15	81	4.8

31a. China? (telephone survey)

	NO 0	YES 1
Public %	8	92

32. Mexico? (printed survey)

	DEF. NO 1	PROB. NO 2	DON'T KNOW 3	PROB. YES 4	DEF. YES 5	Mean
UCS %	47	39	10	3	0	1.7
Labs %	53	37	8	2	0	1.6

32a. Mexico? (telephone survey)

	NO 0	YES 1
Public %	82	18

33. Israel? (printed survey)

	DEF. NO 1	PROB. NO 2	DON'T KNOW 3	PROB. YES 4	DEF. YES 5	Mean
UCS %	1	2	4	38	55	4.5
Labs %	1	2	5	45	47	4.4

33a. Israel? (telephone survey(

	NO 0	YES 1
Public %	8	92

34. Ukraine? (printed survey)

	DEF. NO 1	PROB. NO 2	DON'T KNOW 3	PROB. YES 4	DEF. YES 5	Mean
UCS %	1	4	8	25	62	4.4
Labs %	0	2	8	22	68	4.6

34a. Ukraine? (telephone survey)

	NO 0	YES 1
Public %	23	77

35. Pakistan? (printed survey)

	DEF. NO 1	PROB. NO 2	DON'T KNOW 3	PROB. YES 4	DEF. YES 5	Mean
UCS %	1	8	16	50	26	3.9
Labs %	1	8	20	46	24	3.8

35a. Pakistan? (telephone survey)

	NO 0	YES 1
Public %	32	68

36. North Korea? (printed survey)

	DEF. NO 1	PROB. NO 2	DON'T KNOW 3	PROB. YES 4	DEF. YES 5	Mean
UCS %	2	13	19	53	14	3.6
Labs %	1	7	14	61	17	3.9

36a. North Korea was not included on the telephone survey.

37. How do you think the breakup of the Soviet Union affects the likelihood of the future spread of nuclear weapons? On a scale of 0 to 10, where 0 means the likelihood for future spread of nuclear weapons is **GREATLY REDUCED**, and 10 means the likelihood is **GREATLY INCREASED**, how do you think the breakup of the Soviet Union affects the likelihood that nuclear weapons technology will spread to other countries?

	GREATLY REDUCED 0	1	2	3	4	5	6	7	8	9	GREATLY INCREASED 10	Mean
UCS %	1	1	2	3	4	12	11	18	21	11	15	7.0
Labs %	0	0	1	2	1	6	8	19	23	19	21	7.9

37a. A scale of 1 to 7 was used in the telephone survey to ask the public the same question.

	GREATLY REDUCED 1	2	3	4	5	6	GREATLY INCREASED 7	Mean
Pub %	7	6	10	13	20	17	26	4.9

38. How do you think the spread of nuclear weapons to other countries influences the security of the U.S.? On a scale of 0 to 10, where 0 means the spread of nuclear weapons poses **NO RISK** to the U.S., and 10 means the spread of nuclear weapons poses **EXTREME RISK** to the U.S., how would you rate the risks to the U.S. if more countries have nuclear weapons?

	NO RISK 0	1	2	3	4	5	6	7	8	9	EXTREME RISK 10	Mean
Pub %	1	0	2	3	3	9	9	16	18	8	32	7.6
UCS %	1	1	2	3	2	5	11	18	24	15	18	7.5
Labs %	1	0	1	1	1	5	8	17	27	20	20	7.9

There are several strategies the U.S. could pursue to reduce the spread of nuclear weapons. Some options include using trade agreements, foreign aid, treaties, and military force. On a scale from 1 to 7, where 1 means you **DISAGREE STRONGLY**, and 7 means you **AGREE STRONGLY**, please respond to the following statements:

39. The U.S. should consider providing guarantees of military support to other countries if necessary to prevent them from developing nuclear weapons of their own.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
Pub %	10	6	12	11	20	14	28	4.8
UCS %	11	11	9	15	24	20	11	4.3
Labs %	5	13	10	15	27	23	7	4.4

40. In some cases, the U.S. would be justified in using force to prevent other countries from acquiring nuclear weapons.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
Pub %	8	5	9	10	18	16	35	5.1
UCS %	10	11	8	12	21	26	12	4.5
Labs %	3	6	7	9	25	30	20	5.2

41. It is feasible to eliminate all nuclear weapons world-wide within the next 25 years.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
Pub %	29	14	8	6	11	7	25	3.8
UCS %	16	20	11	10	12	16	15	3.9
Labs %	49	25	9	5	6	4	3	2.2

42. Even if all the nuclear weapons could somehow be eliminated world-wide, it would be extremely difficult to keep other countries from building them again.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
Pub %	5	3	3	4	12	16	56	5.9
UCS %	3	7	6	7	20	32	25	5.3
Labs %	1	1	1	2	10	35	50	6.2

43. Our inquiry now shifts to the possibility of nuclear weapons being used by terrorists. First, what are your perceptions of **TODAY'S** threat of nuclear terrorism? On a scale of 0 to 10, where 0 means there is **NO THREAT** of nuclear weapons being used by terrorists, and 10 means there is **EXTREME THREAT**, how would you rate **TODAY'S** threat of nuclear terrorism occurring anywhere in the world?

	NO THREAT 0	1	2	3	4	5	6	7	8	9	EXTREME THREAT 10	Mean
Pub %	1	2	3	5	6	13	10	14	18	6	22	6.9
UCS %	1	7	9	9	4	10	14	18	14	7	6	5.7
Labs %	0	4	9	8	5	10	15	19	17	9	5	6.0

44. Next we want your opinion about the **FUTURE** threat of nuclear terrorism. On the same scale from 0 to 10, where 0 is **NO THREAT**, and 10 is **EXTREME THREAT**, how would you rate the threat of nuclear weapons being used by terrorists anywhere in the world during the **NEXT TEN YEARS**?

	NO THREAT 0	1	2	3	4	5	6	7	8	9	EXTREME THREAT 10	Mean
Pub %	0	1	3	5	5	15	9	16	17	6	23	7.0
UCS %	1	2	5	7	5	7	11	16	17	16	14	6.8
Labs %	0	1	3	5	3	6	8	18	21	19	15	7.3

Some people think that the use of a nuclear weapon by terrorists may cause the U.S. to take security precautions that would restrict the openness of American society. Others think such restrictions would be unnecessary intrusions on individual rights. Assume for a moment that a nuclear weapon was detonated by terrorists somewhere in **EUROPE**. How do you think it should affect **U.S.** security measures? On a scale from 1 to 7, where 1 means you would **STRONGLY OPPOSE** the measure, and 7 means you would **STRONGLY SUPPORT** it, please indicate how you feel about each of the following possible U.S. government reactions to a nuclear weapon being used by terrorists in Europe.

45. Restricting travel **WITHIN** the U.S.?

	STRONGLY OPPOSE 1	2	3	4	5	6	STRONGLY SUPPORT 7	Mean
Pub %	34	13	12	8	13	5	15	3.3
UCS %	49	23	7	8	8	3	3	2.2
Labs %	45	26	8	5	8	5	2	2.3

46. Restricting travel **TO** and **FROM** the U.S.?

	STRONGLY OPPOSE 1	2	3	4	5	6	STRONGLY SUPPORT 7	Mean
Pub %	10	5	9	10	20	15	31	4.9
UCS %	18	15	9	12	17	17	12	4.0
Labs %	9	14	9	11	20	24	13	4.4

47. Restricting immigration **INTO** the U.S.?

	STRONGLY OPPOSE 1	2	3	4	5	6	STRONGLY SUPPORT 7	Mean
Pub %	7	4	6	7	15	16	45	5.5
UCS %	15	13	9	12	16	17	17	4.2
Labs %	6	10	7	12	19	23	22	4.9

48. If a nuclear weapon was detonated in the U.S. by a terrorist group, and if that group was known to be supported by another country, do you think the U.S. should launch a nuclear attack against that country? On a scale from 1 to 7, where 1 means you would **STRONGLY OPPOSE** a U.S. nuclear response, and 7 means you would **STRONGLY SUPPORT** a U.S. nuclear response, how do you feel about the U.S. using nuclear weapons to attack a country that has supported nuclear terrorism against the U.S.?

	STRONGLY OPPOSE 1	2	3	4	5	6	STRONGLY SUPPORT 7	Mean
Pub %	25	11	8	9	15	8	24	4.0
UCS %	46	18	7	7	7	7	8	2.6
Labs %	18	16	9	11	14	17	15	4.0

49. Now we want to turn to broad issues of U.S. leadership. Using a scale of 0 to 10, where 0 means **NOT IMPORTANT**, and 10 means **EXTREMELY IMPORTANT**, how important are U.S. nuclear weapons for U.S. influence over international events?

	NOT IMPORTANT 0	1	2	3	4	5	6	7	8	9	EXTREMELY IMPORTANT 10	Mean
Pub %	4	3	5	7	7	18	10	15	12	5	16	6.1
UCS %	9	11	13	11	5	10	10	12	9	5	5	4.5
Labs %	1	4	8	7	4	7	11	18	19	11	10	6.4

50. Using the same scale of 0 to 10, how important are U.S. nuclear weapons for maintaining U.S. status as a world leader?

	NOT IMPORTANT 0	1	2	3	4	5	6	7	8	9	EXTREMELY IMPORTANT 10	Mean
Pub %	3	4	5	6	7	15	8	16	11	6	19	6.3
UCS %	13	12	12	11	7	10	9	10	7	3	4	4.1
Labs %	2	4	6	8	4	9	11	17	16	12	11	6.3

51. Using the same scale of 0 to 10, how important do you think it is that the U.S. remain a military superpower?

	NOT IMPORTANT 0	1	2	3	4	5	6	7	8	9	EXTREMELY IMPORTANT 10	Mean
Pub %	1	2	2	3	3	8	7	15	10	8	39	7.6
UCS %	10	6	8	9	5	8	12	14	11	7	11	5.3
Labs %	1	1	2	3	2	5	6	13	18	18	31	7.9

Now consider the storage of radioactive nuclear wastes. On a scale from 1 to 7, where 1 means you **DISAGREE STRONGLY**, and 7 means you **AGREE STRONGLY**, please respond to the following statements about long-term storage of radioactive wastes.

52. Current U.S. ***practices*** are adequate for safe long-term storage of radioactive wastes.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
Pub %	26	14	15	14	17	6	9	3.4
UCS %	55	26	10	4	2	1	1	1.8
Labs %	30	29	16	8	7	7	3	2.7

53. Current ***technologies*** are adequate for safe long-term storage of radioactive wastes.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
Pub %	8	4	6	6	13	15	49	5.5
UCS %	41	26	11	7	6	6	3	2.4
Labs %	11	15	15	12	14	22	12	4.1

54. The long-term storage of radioactive wastes will never be safe.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
Pub %	9	7	8	7	13	14	42	5.2
UCS %	6	12	8	11	17	23	23	4.8
Labs %	31	30	12	8	9	7	3	2.7

55. In your opinion, how well do the experts understand the risks associated with nuclear radiation? On a scale of 1 to 7, where 1 means they **UNDERSTAND VERY LITTLE** about the risks of nuclear radiation, and 7 means they **FULLY UNDERSTAND** the risks, where would you rank the experts' overall understanding of the risks of nuclear radiation?

	UNDERSTAND VERY LITTLE 1	2	3	4	5	6	FULLY UNDERSTAND 7	Mean
Pub %	7	5	11	12	24	19	21	4.8
UCS %	5	9	10	13	25	31	8	4.7
Labs %	1	2	6	9	24	48	9	5.4

56. What is your impression of how much harm nuclear weapons production in the U.S. has done to the environment? On a scale from 1 to 7, where 1 means producing nuclear weapons has caused **NO HARM** to the environment in the U.S., and 7 means it has caused **EXTREME HARM**, how do you rate the environmental effects of producing nuclear weapons in the U.S.?

	NO HARM 1	2	3	4	5	6	EXTREME HARM 7	Mean
Pub %	4	8	12	17	25	13	20	4.7
UCS %	1	8	9	9	32	26	15	5.0
Labs %	2	24	20	15	27	9	3	3.8

57. The U.S. has agreed to reduce the number of its nuclear weapons by about 30 to 40 percent. Some people argue that greater reductions are warranted because of the end of the Cold War. Others argue that international ethnic conflicts, revolutions, and other uncertainties make it risky to reduce below these levels. On a scale from 1 to 7, where 1 means you **STRONGLY OPPOSE** further reductions in U.S. nuclear weapons, and 7 means you **STRONGLY SUPPORT** further reductions, please indicate how you feel about further reducing the number of U.S. nuclear weapons below the levels of current agreements.

	STRONGLY OPPOSE 1	2	3	4	5	6	STRONGLY SUPPORT 7	Mean
Pub %	13	7	10	13	22	11	24	4.5
UCS %	1	2	2	6	10	26	53	6.1
Labs %	12	16	13	14	18	16	10	4.0

58. Some people argue that having a nuclear arsenal means the U.S. can spend less on other types of forces such as tanks and airplanes. Others say that spending for nuclear weapons does not reduce the requirements for other forces. On the same scale of 1 to 7, where 1 means you **DISAGREE STRONGLY**, and 7 means you **AGREE STRONGLY**, please indicate your response to the following statement: "Having a nuclear arsenal means the U.S. can spend less for national defense than would be necessary without nuclear weapons."

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
Pub %	24	15	15	12	17	9	9	3.4
UCS %	38	30	10	9	7	3	3	2.4
Labs %	23	31	14	8	13	9	4	3.0

59. Some people point out that defense industries create large numbers of jobs for American workers, while others argue that they are the wrong kinds of jobs, and that non-defense jobs are more economically productive. On a scale from 1 to 7, where 1 means defense industry jobs are of **LITTLE ECONOMIC VALUE**, and 7 means defense industry jobs are of **GREAT ECONOMIC VALUE**, how would you rate the importance of defense industry jobs in America?

	LITTLE ECONOMIC VALUE 1	2	3	4	5	6	GREAT ECONOMIC VALUE 7	Mean
Pub %	7	9	13	15	23	15	18	4.6
UCS %	26	29	17	10	9	6	2	2.7
Labs %	4	8	12	14	27	27	9	4.7

60. Some people think that decisions about the applications of advanced technologies, such as genetic engineering or nuclear energy, should be made primarily by the public. Other people think that these decisions should be made primarily by technically trained experts. On a scale of 1 to 7, where 1 means that such decisions should mostly be made by **THE PUBLIC**, and 7 means that such decisions should mostly be made by **EXPERTS**, where does your opinion lie?

	THE PUBLIC 1	2	3	4	5	6	EXPERTS 7	Mean
Pub %	8	3	8	19	25	15	22	4.8
UCS %	12	11	11	28	16	15	7	4.0
Labs %	2	5	4	22	25	31	10	5.0

61. Next, how satisfied are you with the accuracy of information that has been made available to the U.S. public about the environmental effects of nuclear weapons production? On a scale from 1 to 7, where 1 means government information has been **HIGHLY INACCURATE**, and 7 means it has been **HIGHLY ACCURATE**, how would you rate the accuracy of official government information to the public about environmental effects of U.S. nuclear weapons production?

	HIGHLY INACCURATE 1	2	3	4	5	6	HIGHLY ACCURATE 7	Mean
Pub %	19	15	22	20	16	4	3	3.2
UCS %	30	33	18	10	6	2	1	2.4
Labs %	7	16	21	23	19	12	1	3.7

Next we are interested in how much trust you place in various agencies for providing the U.S. public with reliable information for making policy choices about nuclear weapons. On a scale of 0 to 10, where 0 is **NO TRUST**, and 10 is **COMPLETE TRUST**, how much do you trust the following groups or agencies to provide reliable information about U.S. nuclear weapons?

62. The Department of Defense?

	NO TRUST 0	1	2	3	4	5	6	7	8	9	COMPLETE TRUST 10	Mean
Pub %	14	10	11	12	11	17	7	8	5	2	4	3.9
UCS %	31	23	19	13	4	4	2	2	1	0	0.	1.8
Labs %	5	7	14	16	9	14	10	12	10	2	0	4.4

63. Watchdog groups critical of U.S. nuclear weapons?

	NO TRUST 0	1	2	3	4	5	6	7	8	9	COMPLETE TRUST 10	Mean
Pub %	6	4	7	12	11	20	10	12	9	4	5	5.0
UCS %	1	2	4	7	7	10	13	21	23	10	2	6.3
Labs %	15	16	22	18	8	8	5	5	2	0	1	2.7

64. The Department of Energy?

	NO TRUST 0	1	2	3	4	5	6	7	8	9	COMPLETE TRUST 10	Mean
Pub %	9	7	8	10	12	23	10	10	6	2	3	4.4
UCS %	21	15	19	17	9	8	5	4	1	0	1	2.6
Labs %	3	6	9	14	11	17	13	13	9	3	1	4.7

65. The U.S. Congress?

	NO TRUST 0	1	2	3	4	5	6	7	8	9	COMPLETE TRUST 10	Mean
Pub %	17	11	13	13	11	17	6	6	2	1	2	3.3
UCS %	11	10	15	17	13	17	8	5	2	1	0	3.4
Labs %	10	11	14	17	13	16	8	8	2	1	1	3.5

66. Scientists employed by the government at the U.S. National Laboratories?

	NO TRUST 0	1	2	3	4	5	6	7	8	9	COMPLETE TRUST 10	Mean
Pub %	10	7	10	12	11	18	9	10	7	3	3	4.3
UCS %	7	9	13	14	12	15	12	10	5	2	0	4.1
Labs %	0	2	3	5	6	11	13	19	23	14	3	6.6

67. Scientists at universities and colleges?

	NO TRUST 0	1	2	3	4	5	6	7	8	9	COMPLETE TRUST 10	Mean
Pub %	4	3	4	7	8	21	13	17	13	5	4	5.7
UCS %	1	1	2	3	6	9	14	22	24	15	2	6.7
Labs %	1	2	4	9	9	18	15	20	15	7	1	5.8

68. The mass media?

	NO TRUST 0	1	2	3	4	5	6	7	8	9	COMPLETE TRUST 10	Mean
Pub %	13	9	10	12	13	19	7	8	5	1	3	3.9
UCS %	11	9	15	15	11	18	11	7	3	1	0	3.6
Labs %	25	20	18	16	7	8	3	1	1	0	0	2.1

69. Some people think the use of nuclear weapons can never be morally justified. Others think their use would be justified if the U.S. was intentionally attacked with nuclear weapons by another country. On a scale from 1 to 7, where 1 means it would be **MORALLY WRONG** for the U.S. to retaliate with nuclear weapons, and 7 means it would be **MORALLY RIGHT** for the U.S. to retaliate if attacked by another country using nuclear weapons, where would your judgment lie?

	MORALLY WRONG 1	2	3	4	5	6	MORALLY RIGHT 7	Mean
Pub %	11	7	10	12	16	12	33	4.8
UCS %	25	15	8	14	13	13	12	3.6
Labs %	5	6	5	13	15	26	29	5.3

70. How important a factor do you think the U.S. nuclear arsenal has been to preserving the American way of life for its citizens during the past 40 years? On a scale from 0 to 10, where 0 means nuclear weapons have been of **NO IMPORTANCE** to preserving the American way of life, and 10 means they have been of **EXTREME IMPORTANCE**, where do you rate the role of nuclear weapons in preserving America's way of life?

	NO IMPORTANCE 0	1	2	3	4	5	6	7	8	9	EXTREME IMPORTANCE 10	Mean
Pub %	4	4	5	7	7	15	9	13	15	6	15	6.1
UCS %	15	10	11	8	5	11	9	12	9	5	5	4.3
Labs %	2	2	3	4	2	5	7	14	19	20	22	7.5

Now we want to understand more about how you feel about American society. Using a scale from 1 to 7, where 1 means you **DISAGREE STRONGLY**, and 7 means you **AGREE STRONGLY**, please respond to each of the following statements.

71. One of the problems with people today is that they have lost their respect for authority.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
Pub %	5	5	7	9	20	20	35	5.3
UCS %	12	18	13	14	22	15	5	3.8
Labs %	4	9	9	12	27	29	10	4.8

72. Even if some people are at a disadvantage, it is best for society to let people succeed or fail on their own.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
Pub %	8	7	10	13	18	17	26	4.8
UCS %	17	25	19	10	15	9	4	3.3
Labs %	2	9	16	10	24	28	11	4.7

73. I support a tax shift so that the burden falls more heavily on corporations and people with large incomes.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
Pub %	12	6	7	10	21	16	29	4.8
UCS %	3	3	3	8	17	33	34	5.7
Labs %	9	15	15	14	24	15	8	4.0

74. For the most part, getting ahead in life is a matter of being lucky.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
Pub %	31	20	15	12	11	5	6	2.9
UCS %	15	36	18	16	11	3	1	2.9
Labs %	17	44	17	12	9	2	1	2.6

75. Society would be much better off if we imposed strict and swift punishment on those who break the rules.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
Pub %	6	4	5	10	17	18	40	5.4
UCS %	8	16	13	17	20	17	9	4.1
Labs %	1	6	7	11	23	32	20	5.2

76. People who get rich in business have a right to keep and enjoy their wealth.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
Pub %	5	3	7	11	22	19	33	5.3
UCS %	6	12	18	17	27	15	4	4.1
Labs %	1	3	5	11	29	36	15	5.3

77. What our society needs is a fairness revolution to make the distribution of goods more equal.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
Pub %	22	12	13	13	16	9	16	3.8
UCS %	8	15	16	14	20	16	11	4.2
Labs %	29	34	14	11	8	3	1	2.5

78. It would be foolish to make serious plans in such an uncertain world.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
Pub %	40	19	9	9	10	4	9	2.8
UCS %	49	36	7	4	2	1	1	1.8
Labs %	44	41	8	3	2	1	1	1.8

79. The **BEST** way to get ahead is to work hard and do what you're told to do.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
Pub %	7	7	11	14	20	16	25	4.8
UCS %	13	21	20	20	16	7	2	3.3
Labs %	6	12	18	23	27	12	2	4.0

80. Society should **NEVER** interfere in how people choose to live their lives.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
Pub %	11	11	12	16	17	12	21	4.4
UCS %	22	25	18	8	12	10	4	3.1
Labs %	17	26	19	10	12	13	3	3.2

81. Most of the harm done in society comes from big corporations and the government.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
Pub %	10	12	14	16	18	13	17	4.3
UCS %	9	23	19	19	16	8	4	3.5
Labs %	18	37	19	3	9	3	1	2.7

82. In politics, no matter how hard we try, things go on pretty much the same.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
Pub %	4	5	6	9	20	20	36	5.4
UCS %	5	16	20	10	24	18	6	4.1
Labs %	2	8	16	11	28	28	7	13
18	2	8	16	11	28	28	7	4.7

Section Two

On a scale from 0 to 10, where 0 means you are **NOT QUALIFIED**, and 10 means you are **HIGHLY QUALIFIED**, please indicate the degree to which you feel qualified to offer expert judgments about scientific questions in each of the following research fields, scientific disciplines, and science policy areas.

83. Life Sciences (biology, environmental biology, agricultural, medical)

	NOT QUALIFIED 0	1	2	3	4	5	6	7	8	9	HIGHLY QUALIFIED 10	Mean
UCS %	6	7	10	6	6	7	9	10	13	13	12	5.7
Labs %	13	18	20	14	5	9	8	6	4	1	1	3.1

84. Physical Sciences (astronomy, chemistry, physics)

	NOT QUALIFIED 0	1	2	3	4	5	6	7	8	9	HIGHLY QUALIFIED 10	Mean
UCS %	8	5	9	9	5	8	10	14	12	10	10	5.5
Labs %	5	6	9	10	6	8	10	13	12	12	9	5.7

85. Environmental Sciences (atmosphere, geologic, oceanography)

	NOT QUALIFIED 0	1	2	3	4	5	6	7	8	9	HIGHLY QUALIFIED 10	Mean
UCS %	7	7	9	10	7	11	12	15	10	6	6	5.1
Labs %	11	11	15	13	8	10	12	9	6	4	2	3.9

86. Mathematics and Computer Science

	NOT QUALIFIED 0	1	2	3	4	5	6	7	8	9	HIGHLY QUALIFIED 10	Mean
UCS %	10	9	13	10	7	9	11	11	8	5	6	4.6
Labs %	3	3	6	7	8	10	13	16	16	12	7	6.1

87. Engineering (aeronautical, astronautical, chemical, civil, electrical, mechanical, metallurgical/materials, nuclear, other)

	NOT QUALIFIED 0	1	2	3	4	5	6	7	8	9	HIGHLY QUALIFIED 10	Mean
UCS %	16	11	12	9	7	8	8	9	7	6	6	4.2
Labs %	3	3	5	5	4	7	7	13	17	17	17	6.8

88. Social Sciences (anthropology, psychology, economics, political science, sociology)

	NOT QUALIFIED 0	1	2	3	4	5	6	7	8	9	HIGHLY QUALIFIED 10	Mean
UCS %	6	6	11	12	9	12	12	12	8	6	5	4.9
Labs %	10	14	17	18	11	13	8	6	3	1	1	3.4

89. On a scale from 1 to 7, where 1 means you have **LITTLE KNOWLEDGE** about national security issues, and 7 means you have **EXTENSIVE KNOWLEDGE** about national security issues, how would you rate your personal level of understanding of national security issues.

	LITTLE KNOWLEDGE 1	2	3	4	5	6	EXTENSIVE KNOWLEDGE 7	Mean
UCS %	3	7	14	21	33	18	4	4.4
Labs %	3	8	13	20	33	19	4	4.4

90. On a scale from 1 to 7, where 1 means you have **LITTLE SCIENTIFIC KNOWLEDGE** about nuclear technology, and 7 means you have **EXTENSIVE SCIENTIFIC KNOWLEDGE** about nuclear technology, how would you rate your personal level of scientific understanding of nuclear technology?

	LITTLE KNOWLEDGE 1	2	3	4	5	6	EXTENSIVE KNOWLEDGE 7	Mean
UCS %	5	10	11	17	31	23	4	4.5
Labs %	2	6	8	12	28	31	13	5.0

91. Some people think that, in general, technological advancements made by defense industries are of little benefit for other areas of the U.S. economy. Others argue that defense technologies can be of great importance in other areas. On a scale from 1 to 7, where 1 means defense related technologies are of **LITTLE VALUE** to other areas of the economy, and 7 means defense related technologies are of **GREAT VALUE** to other areas of the economy, how would you rate the value of technological advances in defense industries for other areas of the U.S. economy?

	LITTLE VALUE 1	2	3	4	5	6	GREAT VALUE 7	Mean
UCS %	5	18	17	17	24	15	4	4.0
Labs %	1	5	5	9	26	38	17	5.4

The next section refers generally to your views of the scientific process. On a scale from 1 to 7, where 1 means you **DISAGREE STRONGLY**, and 7 means you **AGREE STRONGLY**, please respond to each of the following statements about the scientific process as a whole.

92. The scientific process is the only valid and reliable way to understand nature.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
UCS %	7	9	9	7	15	32	22	5.0
Labs %	3	6	9	9	21	37	16	5.1

93. Scientific evidence can be interpreted to fit opposing points of view.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
UCS %	3	11	9	10	24	28	14	4.8
Labs %	3	10	8	12	30	28	9	4.8

94. Intuition can provide an understanding of nature as valid as that of science.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
UCS %	23	27	15	11	12	8	4	3.0
Labs %	16	31	20	14	13	6	1	3.0

95. In principle, science can eventually explain anything.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
UCS %	22	18	13	6	13	20	7	3.6
Labs %	16	17	15	9	16	22	6	3.8

96. The ***results*** of scientific research will always be significantly affected by the values held by the researcher.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
UCS %	8	20	13	10	22	18	8	4.0
Labs %	6	21	15	13	28	15	3	3.9

97. The scientific community has the responsibility to consider the risks and benefits to society of new scientific developments as potential applications become apparent.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
UCS %	1	2	1	3	12	37	44	6.1
Labs %	0	2	3	5	21	47	22	5.7

98. Each scientist has a responsibility to consider the risks and benefits to society of potential applications of the knowledge he or she develops.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
UCS %	2	2	3	4	14	35	41	5.9
Labs %	1	4	4	6	23	42	20	5.5

99. The language and practices of science should never promote one set of values over another.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
UCS %	7	13	10	15	13	23	20	4.6
Labs %	3	8	11	18	16	31	15	4.9

100. Nuclear weapons research is a legitimate area of applied science.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
UCS %	19	17	11	13	18	15	6	3.6
Labs %	2	2	5	8	20	39	24	5.6

101. The rarity of serious accidents in U.S. management of nuclear energy provides a strong argument that the technology is safe.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
UCS %	25	27	14	9	14	8	2	2.9
Labs %	3	8	9	10	23	36	12	5.0

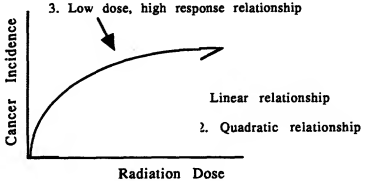
Studies of the relationship between radiation dose and incidence of cancer have had to rely on incomplete data. In particular, data on the low dose effects are statistically inconclusive. Several possible kinds of relationships have been hypothesized:

(1) a **LINEAR RELATIONSHIP**, in which the low-dose effects of radiation have been assumed to be proportionate to high-dose effects

(2) a **QUADRATIC RELATIONSHIP**, in which the effects of radiation at low doses are minimal below some threshold

(3) a **LOW-DOSE, HIGH RESPONSE RELATIONSHIP** in which the effects of radiation are assumed to be proportionately higher at the low dose ranges.

These possible relationships are illustrated in the following graph:



102. Given your own knowledge of radiation effects on humans and other organisms, which of the above hypothesized relationships do you think is most likely to be correct?

	Linear 1	Quadratic 2	Low-dose, high response 3	Don't know 4
UCS %	21	46	11	22
Labs %	11	70	3	16

103. Which of the hypothesized relationships do you think should be assumed for purposes of setting public safety standards for management of radioactive materials?

	Linear 1	Quadratic 2	Low-dose, high response 3	Don't know 4
UCS %	35	15	38	13
Labs %	40	28	20	12

104. Historians of science have differed in their views of how the scientific process works. Some hold that the accumulation of scientific knowledge is a gradual, ***incremental*** process in which new theories encompass the valid portions of those that went before. Others have argued that change in science is more abrupt and ***revolutionary***, with new theories providing completely new ways of understanding the phenomena under study. Using a scale from 1 to 7, where 1 means scientific change is **ALWAYS INCREMENTAL**, and 7 means scientific change is **ALWAYS REVOLUTIONARY**, how would you characterize scientific change?

	ALWAYS INCREMENTAL 1	2	3	4	5	6	ALWAYS REVOLUTIONARY 7	Mean
UCS %	1	9	15	42	24	8	1	4.1
Labs %	1	13	17	40	21	6	0	3.9

The roles of political ideology and political culture in science are also widely debated. On a scale from 1 to 7, where 1 means you **DISAGREE STRONGLY**, and 7 means you **AGREE STRONGLY**, please respond to the following statements.

105. Technological advances are dependent on advances in basic science.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
UCS %	1	3	7	7	22	38	22	5.5
Labs %	1	3	9	8	23	43	13	5.3

106. Broad participation by scientists in the policy process is necessary for setting good national security priorities.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
UCS %	0	2	4	6	23	42	24	5.7
Labs %	0	2	4	10	32	41	11	5.4

107. More emphasis should be placed on society's environmental problems and less placed on individuals' economic rights.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
UCS %	1	3	4	8	23	33	27	5.6
Labs %	3	10	16	26	24	17	5	4.3

108. Those who are better informed should have more influence in policy making.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
UCS %	1	3	3	11	29	37	16	5.4
Labs %	1	1	3	10	31	42	12	5.4

109. All species have an inherent right to exist, quite apart from any instrumental use to humankind.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
UCS %	5	5	6	7	12	25	40	5.5
Labs %	6	10	13	13	17	23	17	4.6

110. Environmental regulations should not be promulgated unless the proponents can prove that the economic benefits to society exceed the costs.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
UCS %	37	31	13	6	5	4	3	2.4
Labs %	11	20	19	14	16	14	5	3.7

111. One person's right to a clean environment is not as important as another person's right to gainful employment.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
UCS %	36	32	15	12	3	2	1	2.2
Labs %	13	26	24	23	10	3	1	3.1

112. Even if the public is uninformed about an issue, the only proper course is to rely on popular opinion in making important policy decisions about that issue.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
UCS %	30	33	16	8	7	3	2	2.5
Labs %	29	40	17	5	5	3	1	2.3

There is substantial disagreement over whether it is acceptable for government to impose risks on individuals without their consent. Using a scale from 1 to 7, where 1 means you **DISAGREE STRONGLY**, and 7 means you **AGREE STRONGLY**, please respond to the following statements.

113. When the risk is very small, it is okay for the government to impose that risk on individuals without their consent.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
UCS %	29	24	11	8	15	10	2	2.9
Labs %	20	20	13	11	18	14	4	3.4

114. Even if the potential benefits to society are very large, it is wrong for the government to impose risk on individuals without their consent.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
UCS %	6	13	12	7	13	24	26	4.8
Labs %	6	13	17	9	14	22	18	4.5

115. It is okay for the government to impose risk without consent if the individuals harmed by the policy are compensated for their loss.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
UCS %	45	28	10	8	6	3	1	2.2
Labs %	36	30	14	10	6	3	1	2.3

116. For society as a whole to survive and prosper, it is necessary that risks and sacrifices be accepted.

	DISAGREE STRONGLY 1	2	3	4	5	6	AGREE STRONGLY 7	Mean
UCS %	7	6	4	15	22	29	18	5.0
Labs %	2	4	4	12	25	32	21	5.3

Many areas of scientific inquiry involve questions that are the focus of political controversy, such as research on the potential mechanisms underlying global climate change, ozone depletion, the human effects of radiation exposure, or acid rain. On many such issues, scientists themselves participate in the dispute for a number of different reasons. On a scale from 0 to 10, where 0 means the factor is **NOT A CONTRIBUTOR** at all, and 10 means the factor is a **MAJOR CONTRIBUTOR**, please indicate your judgment of the contribution of each of the following factors to dispute among equally qualified scientists.

117. Complexity of the phenomena under study.

	NOT A CONTRIBUTOR 0	1	2	3	4	5	6	7	8	9	MAJOR CONTRIBUTOR 10	Mean
UCS %	1	1	1	1	1	5	5	10	24	27	24	8.1
Labs %	0	0	1	2	1	6	4	14	28	27	16	8.0

118. Bias due to researchers' values.

	NOT A CONTRIBUTOR 0	1	2	3	4	5	6	7	8	9	MAJOR CONTRIBUTOR 10	Mean
UCS %	0	2	4	6	4	9	15	23	20	8	7	6.6
Labs %	0	1	6	5	6	9	18	24	21	8	3	6.4

119. Bias due to research sponsors' values.

NOT A CONTRIBUTOR										MAJOR CONTRIBUTOR		
	0	1	2	3	4	5	6	7	8	9	10	Mean
UCS %	1	2	3	6	5	7	13	20	18	13	13	6.9
Labs %	0	2	6	7	6	10	17	21	20	8	3	6.2

120. Honest mistakes made by researchers.

NOT A CONTRIBUTOR										MAJOR CONTRIBUTOR		
	0	1	2	3	4	5	6	7	8	9	10	Mean
UCS %	1	5	8	9	7	17	19	16	11	4	2	5.3
Labs %	1	3	11	10	9	21	17	15	9	2	1	5.1

121. Researchers operating from opposing theoretical frameworks.

NOT A CONTRIBUTOR										MAJOR CONTRIBUTOR		
	0	1	2	3	4	5	6	7	8	9	10	Mean
UCS %	1	2	2	5	4	15	13	21	20	10	6	6.6
Labs %	1	1	4	6	5	15	14	23	19	10	4	6.5

122. Media misrepresentation of research findings.

NOT A CONTRIBUTOR										MAJOR CONTRIBUTOR		
	0	1	2	3	4	5	6	7	8	9	10	Mean
UCS %	2	4	8	9	7	11	12	15	14	9	8	5.9
Labs %	2	4	6	6	4	8	10	14	18	14	13	6.5

123. Political uses of scientific findings.

NOT A CONTRIBUTOR										MAJOR CONTRIBUTOR		
	0	1	2	3	4	5	6	7	8	9	10	Mean
UCS %	0	1	3	4	4	9	10	19	22	17	12	7.1
Labs %	0	1	4	4	4	9	11	18	20	16	11	6.5

124. How do you think scientific dispute over the nature of complex phenomena affect our understanding of the phenomena? On a scale from 1 to 7, where 1 means scientific dispute **IMPEDES UNDERSTANDING**, and 7 means scientific dispute **ASSISTS UNDERSTANDING**, how do you think scientific dispute affects our understanding of complex phenomena?

	IMPEDES UNDERSTANDING 1	2	3	4	5	6	ASSISTS UNDERSTANDING 7	Mean
UCS %	1	6	6	7	17	42	21	5.4
Labs %	1	6	7	10	21	41	13	5.2

In your view, what forums are the most appropriate for engaging in scientific debate that is relevant for public policy? On a scale from 1 to 7, where 1 means **COMPLETELY INAPPROPRIATE**, and 7 means **COMPLETELY APPROPRIATE**, how would you characterize the following forums in terms of their suitability for scientific debates that are relevant for public policy?

125. Articles in academic journals.

	COMPLETELY INAPPROPRIATE 1	2	3	4	5	6	COMPLETELY APPROPRIATE 7	Mean
UCS %	1	2	2	3	7	22	64	6.4
Labs %	1	3	3	4	13	34	42	6.0

126. Testimony at legislative hearings.

	COMPLETELY INAPPROPRIATE 1	2	3	4	5	6	COMPLETELY APPROPRIATE 7	Mean
UCS %	1	2	3	6	15	28	45	6.0
Labs %	1	3	10	11	22	30	23	5.3

127. Presentations at scientific conferences.

	COMPLETELY INAPPROPRIATE 1	2	3	4	5	6	COMPLETELY APPROPRIATE 7	Mean
UCS %	0	1	1	3	8	26	61	6.4
Labs %	1	1	2	5	13	38	40	6.1

128. Articles in the popular media.

	COMPLETELY INAPPROPRIATE 1	2	3	4	5	6	COMPLETELY APPROPRIATE 7	Mean
UCS %	2	5	9	13	18	22	30	5.3
Labs %	5	10	14	15	21	22	14	4.6

129. Participation in television talk shows.

	COMPLETELY INAPPROPRIATE 1	2	3	4	5	6	COMPLETELY APPROPRIATE 7	Mean
UCS %	8	12	9	14	16	17	24	4.7
Labs %	14	17	15	13	17	15	11	3.9

Turning now to the process of actually communicating scientific findings, on a scale from 1 to 7, where 1 means scientific information is **EASY TO COMMUNICATE**, and 7 means scientific information is **DIFFICULT TO COMMUNICATE**, how readily can scientific ***conclusions*** be communicated ***to*** each of the following?

130. Reporters for the mass media.

	EASY TO COMMUNICATE 1	2	3	4	5	6	DIFFICULT TO COMMUNICATE 7	Mean
UCS %	1	7	13	12	26	31	9	4.9
Labs %	1	3	7	8	22	44	15	5.4

131. Members of the public.

	EASY TO COMMUNICATE 1	2	3	4	5	6	DIFFICULT TO COMMUNICATE 7	Mean
UCS %	1	4	8	12	23	38	14	5.2
Labs %	1	3	6	11	25	40	14	5.3

132. Public policy makers (e.g., legislators and political appointees).

	EASY TO COMMUNICATE 1	2	3	4	5	6	DIFFICULT TO COMMUNICATE 7	Mean
UCS %	1	6	12	18	29	26	9	4.8
Labs %	0	4	12	16	27	29	11	5.0

Using the same scale, how readily can scientific ***uncertainties*** be communicated ***to*** each of the following?

133. Reporters for the mass media.

	EASY TO COMMUNICATE 1	2	3	4	5	6	DIFFICULT TO COMMUNICATE 7	Mean
UCS %	2	6	11	8	18	36	19	5.2
Labs %	1	3	6	6	17	39	28	5.6

134. Members of the public.

	EASY TO COMMUNICATE 1	2	3	4	5	6	DIFFICULT TO COMMUNICATE 7	Mean
UCS %	2	5	8	9	17	33	26	5.4
Labs %	1	3	5	9	17	37	27	5.6

135. Public policy makers (e.g., legislators and political appointees).

	EASY TO COMMUNICATE 1	2	3	4	5	6	DIFFICULT TO COMMUNICATE 7	Mean
UCS %	1	6	10	14	23	33	15	5.1
Labs %	1	4	8	12	24	33	18	5.2

Next, we are interested in knowing how you allocate your professional time. Approximately what percentage of your professional time is spent on each of the following activities:

	UCS (mean)	Labs (mean)
136. Supervision	10	13
137. Administration	12	18
138. Teaching	19	4
139. Basic research	17	13
140. Applied research	13	32
141. Policy research	3	4
142. Other	24	16

In the course of your own work, have you ever presented research findings in any of the following ways:

143. Editorial commentary in the popular press:

	No 0	Yes 1
UCS %	72	28
Labs %	93	7

144. Testimony before legislative bodies:

	No 0	Yes 1
UCS %	80	20
Labs %	95	5

145. Testimony before administrative agencies:

	No 0	Yes 1
UCS %	67	33
Labs %	76	24

146. Articles in professional journals:

	No 0	Yes 1
UCS %	27	73
Labs %	31	69

147. Presentations at professional conferences:

	No 0	Yes 1
UCS %	21	79
Labs %	22	78

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148. On a scale of political ideology, individuals can be arranged from strongly liberal to strongly conservative. Using the options listed below, please check the box which best characterizes your own political views.

	STRONGLY LIBERAL 1	2	3	4	5	6	STRONGLY CONSERVATIVE 7	Mean
Pub %	4	12	12	28	17	19	9	4.3
UCS %	18	42	21	10	6	3	0	2.6
Labs %	2	9	16	16	28	15	4	4.5

149. With which political party do you identify?

	DEMOCRAT	REPUBLICAN	INDEPENDENT	OTHER
	1	2	3	4
Public %	43	39	16	2
UCS%	67	6	22	5
Labs %	29	48	19	4

150. Do you slightly identify, somewhat identify, or completely identify with that political party?

	SLIGHTLY	SOMEWHAT	COMPLETELY	
	1	2	3	Mean
Public %	18	55	26	2.1
UCS%	21	62	17	2.0
Labs %	27	63	10	1.8

Section Three

Now we need to ask a few demographic questions concerning such things as education, work, income, and family. Again we assure you, your name will not be associated with any of the information.

151. First, what is your highest level of education?

	Public %	UCS %	Labs %
Less than high school graduate	6	0	0
High school graduate	24	0	0
Some college/vocational school	32	3	6
College graduate	20	9	12
Some graduate work	5	10	10
Master's degree	9	20	34
Doctorate	3	55	38
Other	1	2	1

152. Please indicate your most recent field of study in college or graduate school.

	Public %	UCS %	Labs %
Physical sciences	6	36	32
Medicine	9	12	1
Engineering	9	13	52
Business	24	2	3
Law	4	1	1
Social sciences	11	9	1
Fine arts	4	2	1
Humanities	18	3	0
Other	15	22	10

153. Which of the following categories most closely describes your current or most recent professional affiliation?

	UCS %	Labs %
Industrial firm	12	0
University	34	2
Four-year college	5	0
Non-educational nonprofit institution	3	2
Federally funded research and development center	5	85
Private practice or consulting	18	1
State or local agency	5	0
Federal agency or department	6	5
Foreign or international organization	1	0
Other	13	4

154. How old were you on your last birthday?

Public (mean)	UCS (mean)	Labs (mean)
42.3	52.8	43.7

155. Please indicate which of the following income categories approximates the total estimated annual income for your ***household***.

Income Category	Public%	UCS%	Labs%
1. $0 - $14,999	12	3	0
2. $15 - $29,999	22	7	1
3. $30 - $44,999	24	13	9
4. $45 - $59,999	16	17	15
5. $60 - $74,999	9	15	23
6. $75 - $89,999	4	11	17
7. $90 - $104,999 (>90 for public)	7	12	14
8. $105- $119,999	NA	6	9
9. $120- $134,999	NA	5	5
10. $135- $149,999	NA	4	4
11. $150,000 or more	NA	8	4

Public (estimated mean)	UCS (estimated mean)	Labs (estimated mean)
$35,000 - $40,00	$60,000 - $74,999	$75,000 - $89,999

156. Do you have children 18 years of age or younger?

	No 0	Yes 1
Public %	58	42
UCS %	72	28
Labs %	55	45

157. Are you female or male?

	Female 0	Male 1
Public %	51	49
UCS %	23	77
Labs %	18	82

158. Which of the following best describes your race or ethnic background?

	Public %	UCS %	Labs %
1. White (not Hispanic)	84	94	89
2. Black	6	1	0
3. Hispanic	4	1	3
4. American Indian	2	0	0
5. Asian	2	1	4
6. Other	2	1	2
7. Don't Know	0	1	0

APPENDIX 2

NATIONAL SECURITY SURVEY FOCUS GROUPS

A-2.1: PARTICIPANTS

FOCUS GROUP 1 (15 JUNE 93): GENERAL PUBLIC

	Gender	Occupation/Profession/Training
1.	M	College student, University of New Mexico (UNM)
2.	M	Insurance agent
3.	F	Research nutritionist in UNM College of Pharmacy
4.	F	College graduate; homemaker
5.	M	Employee, Albuquerque Water Department
6.	M	Retired firefighter/investigator; sports official; safety consultant
7.	M	Retired firefighter; construction; Peace Corps volunteer to South America
8.	F	Retired public school teacher; grandmother
9.	F	Employee in the Marketing and Planning Department of Presbyterian Hospital
10.	F	Homemaker and home educator
11.	M	Industrial maintenance and steel fabrication

FOCUS GROUP 2 (24 JUNE 93): NUCLEAR-SUPPORTIVE SCIENTISTS

	Gender	Occupation/Profession/Training
1.	F	Nuclear engineer; employee of an environmental consulting firm
2.	M	Nuclear engineer; professor in Chemical and Nuclear Engineering Department, UNM
3.	M	Electrical engineer; New Mexico Weapons Development Center, Sandia NL
4.	M	Operations research and analysis; retired army; a generalist in the nuclear weapons program at Los Alamos NL
5.	M	Electrical engineer; Sandia, NL
6.	F	Engineer; works nuclear weapons programs for the USAF

FOCUS GROUP 3 (28 JUNE 93): NUCLEAR-CRITICAL SCIENTISTS

	Gender	Occupation/Profession/Training
1.	M	Mechanical engineer; formerly with Bureau of Standards, now a science teacher in middle school
2.	M	Physicist; Congressional Science Fellow
3.	M	Physicist; Formerly a Congressional Science Fellow; currently an independent consultant working proliferation issues
4.	M	Organic chemist; Independent consultant for the EPA, National Cancer Institute, National Institute for Health, others
5.	M	Physicist; adjunct professor of physics at Georgetown University
6.	M	Physicist; founding member of Union of Concerned Scientists; currently employed by the World Resources Institute
7.	F	Sociologist; formerly with the UN, currently involved with nongovernment organizations and private volunteer organizations in international settings
8.	M	Physicist; formerly in Department of State; former staff member of the American Association for the Advancement of Science; now faculty member of Georgetown University's School of International Affairs
9.	M	Technology and Public Policy; staff member of the Federation of American Scientists

A-2.2: PERCEPTIONS OF SELECTED ISSUES

1. U.S. National Security and the Nature of the Threat

It quickly became apparent that the term "national security" requires specification. To the general public group, it had two overlapping components: external and internal concerns. National security appeared to be more clearly linked to international issues when addressed by the scientist groups, but all three groups differentiated between domestic and international security issues.

External Security: A majority of each of the three focus groups felt that the nature of potential threats to U.S. national security has radically changed since the end of the Cold War. Many felt that the ideological struggle with its clearly defined boundaries of dispute and neatly categorized allies and adversaries has been replaced with a much more amorphous, confusing, and unpatterned array of potential threats characterized by ethnic, cultural, and economic struggles. The political and economic stability of Russia and the Soviet successor states was worrisome to most, and security of nuclear arms in the former Soviet republics was of special concern. The spread of nuclear weapons was perceived by many to be a threatening trend, with concern voiced over North Korea, Iraq, Iran, and other potential proliferants. The terrorist attack against the World Trade Center in New York was cited as evidence that the U.S. is not immune to terrorist attack, and the threat of nuclear terrorism was considered by many to be both real and near-term.

Internal Security: The general public group and the scientists more critical of nuclear weapons evidenced particular concern over crime, drugs, and a general deterioration of America's social fabric. For the public group, the concept of "security" contained a strong personal element reflecting social and political issues affecting the daily lives of citizens. Several voiced lack of confidence in elected officials to deal with social and economic issues.

Overall: A majority of the public focus group felt that U.S. national security, both externally and internally, has decreased since the end of the Cold War. Members of both scientist groups commented less on domestic concerns, and emphasized the changing nature of the international order. All three groups felt that the less distinct nature of potential threats, operating with less predictability within the international system, is creating varying levels of anxiety and apprehension among the American public.

2. Safety of U.S. Nuclear Weapons

Each of the three groups expressed virtual unanimity that U.S. nuclear weapons are managed safely. They evidenced little or no concern over issues of design, transport, storage, security, command and control, or most other aspects of weapons management. When pressed to identify the weakest link in the nuclear weapons process, members of both scientist groups pointed to operational nuclear alert procedures. However, some members of all three groups were of the opinion that environmental effects of nuclear weapons production had not been adequately addressed in the past, and that the Department of Energy had not always been honest with the public about environmental issues. The scientists who were more supportive of nuclear weapons both evidenced and criticized a historical tendency to assume that scientific elites know best about how to pursue the public's interests in nuclear matters.

With regards to nuclear testing, members of the public group felt that testing for the sake of building bigger or more efficient nuclear weapons is not warranted, but could see some rationale for testing to enhance safety or to further nuclear technologies having greater social utility, but gave no specific examples. Scientists less critical of nuclear weapons in the second group were not asked to comment on testing. Scientists in the third group who were more critical of nuclear weapons were generally not supportive of further testing, with one participant characterizing nuclear weapons as having been essentially "perfected."

3. Risk Perceptions About Nuclear Technologies

Within the public focus group, risk perceptions about nuclear matters included: waste disposal and its effects on the environment; nuclear proliferation; and nuclear terrorism. Scientists in the nuclear-supportive group commented on the need to more closely consider environmental issues and public relations, the need for a new approach to containing nuclear proliferation, and concern that nuclear terrorism may occur. Scientists in the nuclear-critical group were also concerned about proliferation and terrorism, and about

the international security of fissionable materials and management of disarmament. They also voiced reservations about research which could lead to miniaturization of nuclear devices. In addition to these issues, the group raised the problem of political stability in the long-term management of weapons materials. They contrasted the 24,000 year half-life of plutonium with historical cycles of the rise and fall of political systems, all of which have been dramatically shorter. Observing that security requirements for weapons grade materials are likely to exceed any existing political arrangements, and noting the uncertainty which such materials may meet during political change (such as that occurring in the Soviet successor states) they considered long-term political/social evolution to be a significant problem in the management of nuclear technologies.

4. Trust

The general public group evidenced a sharp demarcation between trust of government institutions. Uniformed military services were generally accorded a higher level of trust than were other government agencies or personnel involved in nuclear weapons management. While acknowledging the need to maintain secrecy about certain nuclear technologies, government secrecy or incomplete information about nuclear wastes and other environmentally sensitive issues was criticized. The nuclear-supportive scientists were reluctant to consider means by which more information about nuclear matters could safely be made public, but recognized that the nuclear establishment had not done all it should to emphasize to the public the priority given to nuclear safety in every phase of weapons development and management. Nuclear-critical scientists criticized any governmental position which rested on a "trust me" approach to nuclear policy. One member characterized distrust of government as quintessentially "American," and blind trust in government as "unAmerican."

All three groups acknowledged the relevance of the excellent record of U.S. nuclear safety, while at the same time recognizing its fragility. It was noted that one nuclear acci-

dent, unauthorized employment, or incident of nuclear terrorism in the U.S. or abroad could shatter public confidence in and tolerance of nuclear weapons.

Members from the public group and the more nuclear-critical group also discussed differing levels of public trust in the nuclear energy industry and those charged with nuclear weapons management. In general, they felt the American public has much more confidence about the management and safety of U.S. nuclear weapons than they do about U.S. nuclear energy production. The one area in which public trust about nuclear weapons has already been degraded seemed to be environmental damage associated with nuclear weapons production, which, in the views of many focus group participants, has not always been openly and adequately addressed by responsible agencies. The general public and nuclear-critical group saw considerable utility in special interest groups and media scrutiny of nuclear policy. One participant of the general public group indicated her dependence on such watch-dog organizations and the media to publicize issues which she otherwise did not have the time or inclination to follow.

5. Utility of Nuclear Weapons

A significant majority of all three focus groups considered U.S. nuclear weapons to be necessary to U.S. national security for the immediate future. They implied that for the present, the perceived benefits and utilities of nuclear weapons exceed their perceived costs and risks, *given that other nations have such weapons.* Three members of the nuclear-critical group felt that the U.S. should unilaterally reject nuclear weapons, but while many participants of all three groups expressed hope that nuclear weapons might be reduced and eventually eliminated, most did not think that the U.S. should unilaterally disarm, and did not foresee a future free of nuclear weapons.

All three groups viewed nuclear proliferation and potential nuclear terrorism to be among the greatest challenges of the post-Cold War environment. All groups were concerned with potential international conflict over global energy resources. There also seemed to be a

general feeling that, where possible, the U.S. should utilize the United Nations and other avenues for multilateral cooperation as opposed to unilateralism in security matters, and that both competition and cooperation between nations is increasingly influenced by the global economy. It was recognized by all three groups that nuclear weapons cannot be used to resolve most international issues. Thus while nuclear weapons were acknowledged to have continuing value for strategic deterrence, they were judged to have a narrowing range of applicability.

APPENDIX 3

NATIONAL SECURITY SURVEY RESPONSE RATES

GENERAL PUBLIC SURVEY (Telephone)

1. Cooperation Rate = $\frac{\text{Completes}}{\text{Completes + Refusals}}$ = 67.0%

2. Refusal Rate = $\frac{\text{Completes}}{\text{Completes + Refusals + Reluctants}}$ = 38.8%

3. Overall Rate = $\frac{\text{Completes}}{\text{Completes + Refusals + Reluctants + Busy + Non-English + Ill + Hearing Impaired + Answering Machines + NA}}$ = 25.1%

UNION OF CONCERNED SCIENTISTS (Printed)

1. Targeted Sample	=	2,148
- No Forwarding Address	=	37
- Unable (Death, Health, etc.)	=	21
2. Adjusted Baseline	=	2,090
3. Valid Responses	=	1,155
4. Response Rate $\frac{1155}{2090}$	=	55.3%

NATIONAL LABORATORIES (Printed)

1. Pacific Northwest Laboratory

- Targeted Sample	=	350
- Valid Responses	=	202
- Response Rate $\frac{202}{350}$	=	57.7%

2. Lawrence Berkeley Laboratory

- Targeted Sample		=	151
-- Non-U.S. Citizen		=	1
- Valid Responses		=	124
- Response Rate	$\frac{124}{150}$	=	82.6%

3. Sandia National Laboratories

- Targeted Sample		=	900
-- Deceased		=	1
- Valid Responses		=	631
- Response Rate	$\frac{631}{899}$	=	70.2%

4. Los Alamos National Laboratory

- Targeted Sample		=	900
- Valid Responses			270
- Response Rate	$\frac{270}{900}$	=	30.0%

5. Combined National Laboratories

- Targeted Sample		=	2299
- Combined Response Rate	$\frac{1226}{2299}$	=	53.3%

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